CDC

MMWR

MORBIDITY AND MORTALITY WEEKLY REPORT

Vol. 41 / No. SS-4

CDC Surveillance Summaries

August 28, 1992

Special Focus II: Public Health Surveillance and International Health 1992

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control
Atlanta, Georgia 30333

The *MMWR* series of publications is published by the Epidemiology Program Office, Centers for Disease Control, Public Health Service, U.S. Department of Health and Human Services, Atlanta, Georgia 30333.

SUGGESTED CITATION

General: Centers for Disease Control. CDC *Surveillance Summaries.* Special Focus II: Public Health Surveillance and International Health, August 28, 1992: *MMWR* 1992;41:(No. SS-4).

Specific: Centers for Disease Control. [Title of particular article.] In CDC *Surveillance Summaries,* August 28, 1992. *MMWR* 1992;41(No. SS-4): [inclusive page numbers].

Copies can be purchased from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402-9325. Telephone: (202) 783-3238.

Contents

Most Recent Reports Published in the MMWR Surveillance Summaries

Subject	Responsible CIO*	Most Recent Report
Abortion	NCCDPHP	1991; Vol. 40, No. SS-2
AIDS/HIV		
Distribution by Racial/Ethnic Group	NCID	1988; Vol. 37, No. SS-3
Among Black and Hispanic Children and Women of Childbearing Age	NCEHIC	1990; Vol. 39, No. SS-3
Behavioral Risk Factors	NCCDPHP	1991; Vol. 40, No. SS-4
Birth Defects		
B.D. Monitoring Program (see also Malformations)	NCEHIC	1990; Vol. 39, No. SS-4
Contribution of B.D. to Infant Mortality Among Minority Groups	NCEHIC	1990; Vol. 39, No. SS-3
Breast and Cervical Cancer	NCCDPHP	1992; Vol. 41, No. SS-2
Campylobacter	NCID	1988; Vol. 37, No. SS-2
Chancroid	NCPS	1992; Vol. 41, No. SS-3
Cholera	NCID	1992; Vol. 41, No. SS-1
Coal Workers' Health (see also Mining)	NIOSH	1985; Vol. 34, No. 1SS
Congenital Malformations, Minority Groups	NCEHIC	1988; Vol. 37, No. SS-3
Contraception Practices	NCCDPHP	1992; Vol. 41, No. SS-4
Cytomegalovirus Disease, Congenital	NCID	1992; Vol. 41, No. SS-2
Dengue	NCID	1985; Vol. 34, No. 2SS
Dental Caries and Periodontal Disease Among Mexican-American Children	NCPS	1988; Vol. 37, No. SS-3
Dracunculiasis	NCID	1992; Vol. 41, No. SS-1
Ectopic Pregnancy	NCCDPHP	1990; Vol. 39, No. SS-4
Ectopic Pregnancy, Mortality	NCCDPHP	1987; Vol. 36, No. SS-2
Elderly, Hospitalizations Among	NCCDPHP	1991; Vol. 40, No. SS-1
Endometrial and Ovarian Cancers	EPO, NCCDPHP	1986; Vol. 35, No. 2SS
Escherichia coli O157	NCID	1991; Vol. 40, No. SS-1
Evacuation Camps	EPO	1992; Vol. 41, No. SS-4
Foodborne Disease	NCID	1990; Vol. 39, No. SS-1
Gonococcal Infection	NCPS, NCID	1984; Vol. 33, No. 4SS
Gonorrhea and Salpingitis, Teenagers	NCPS, NCID	1983; Vol. 32, No. 3SS
Health Surveillance Systems	IHPO	1992; Vol. 41, No. SS-4
Hepatitis	NCID	1985; Vol. 34, No. 1SS
Hepatitis, Viral	NCID	1983; Vol. 32, No. 2SS
Homicide	NCEHIC	1992; Vol. 41, No. SS-3
Homicides, Black Males	NCEHIC	1988; Vol. 37, No. SS-1
Hysterectomy	NCCDPHP	1986; Vol. 35, No. 1SS
Infant Mortality (see also National Infant Mortality; Birth Defects; Postneonatal Mortality)	NCEHIC	1990; Vol. 39, No. SS-3
Influenza	NCID	1992; Vol. 41, No. SS-3
Injury		
Death Rates, Blacks and Whites	NCEHIC	1988; Vol. 37, No. SS-3
Drownings	NCEHIC	1988; Vol. 37, No. SS-1
Falls, Deaths	NCEHIC	1988; Vol. 37, No. SS-1
Firearm-Related Deaths, Unintentional	NCEHIC	1988; Vol. 37, No. SS-1
In Developing Countries	NCEHIC	1992; Vol. 41, No. SS-1
In the Home, Persons <15 Years of Age	NCEHIC	1988; Vol. 37, No. SS-1
Motor Vehicle-Related Deaths	NCEHIC	1988; Vol. 37, No. SS-1
Objectives of Injury Control, State and Local	NCEHIC	1988; Vol. 37, No. SS-1
Objectives of Injury Control, National	NCEHIC	1988; Vol. 37, No. SS-1
Residential Fires, Deaths	NCEHIC	1988; Vol. 37, No. SS-1
Tap Water Scalds	NCEHIC	1988; Vol. 37, No. SS-1
Lead Poisoning, Childhood	NCEHIC	1990; Vol. 39, No. SS-4
Low Birth Weight	NCCDPHP	1990; Vol. 39, No. SS-3

*All abbreviations are listed at end of inventory. Readers should check individual summaries when more than one CIO is responsible.

Most Recent Reports Published in the MMWR Surveillance Summaries — Continued

Subject	Responsible CIO*	Most Recent Report
Malaria, Imported	NCID	1983; Vol. 32, No. 3SS
Malformations (see also Birth Defects)	NCEHIC	1985; Vol. 34, No. 2SS
Maternal Mortality	NCCDPHP	1991; Vol. 40, No. SS-2
Measles	NCPS	1992; Vol. 41, No. SS-4
Mining (see also Coal Workers' Health)	NIOSH	1986; Vol. 35, No. 2SS
National Infant Mortality (see also Infant Mortality; Birth Defects)	NCCDPHP	1989; Vol. 38, No. SS-3
Nosocomial Infection	NCID	1986; Vol. 35, No. 1SS
Occupational Injuries/Disease		
Among Loggers	NIOSH	1983; Vol. 32, No. 3SS
Hazards, Occupational	NIOSH	1985; Vol. 34, No. 2SS
In Meatpacking Industry	NIOSH	1985; Vol. 34, No. 1SS
State Activities	NIOSH	1987; Vol. 36, No. SS-2
Treated in Hospital Emergency Rooms	NIOSH	1983; Vol. 32, No. 2SS
Ovarian Cancer (see Endometrial and Ovarian Cancers)		
Parasites, Intestinal	NCID	1991; Vol. 40, No. SS-4
Pediatric Nutrition	NCCDPHP	1983; Vol. 32, No. 4SS
Pelvic Inflammatory Disease	NCPS	1983; Vol. 32, No. 4SS
Plague	NCID	1985; Vol. 34, No. 2SS
Plague, American Indians	NCID	1988; Vol. 37, No. SS-3
Pneumoconiosis, Coal Miners	NIOSH	1983; Vol. 32, No. 1SS
Poliomyelitis	NCPS	1992; Vol. 41, No. SS-1
Postneonatal Mortality	NCCDPHP	1991; Vol. 40, No. SS-2
Pregnancy, Teenage	NCCDPHP	1987; Vol. 36, No. 1SS
Psittacosis	NCID	1983; Vol. 32, No. 1SS
Rabies	NCID	1989; Vol. 38, No. SS-1
Racial/Ethnic Minority Groups	Various	1990; Vol. 39, No. SS-3
Respiratory Disease	NCEHIC	1992; Vol. 41, No. SS-4
Reye Syndrome	NCID	1984; Vol. 33, No. 3SS
Rocky Mountain Spotted Fever	NCID	1984; Vol. 33, No. 3SS
Rotavirus	NCID	1992; Vol. 41, No. SS-3
Rubella and Congenital Rubella	NCPS	1984; Vol. 33, No. 4SS
Salmonella	NCID	1988; Vol. 37, No. SS-2
Salpingitis (see Gonorrhea and Salpingitis)		
Sexually Transmitted Diseases in Italy	NCPS	1992; Vol. 41, No. SS-1
Smoking	NCCDPHP	1990; Vol. 39, No. SS-3
Sudden Unexplained Death Syndrome Among Southeast Asian Refugees	NCEHIC, NCPS	1987; Vol. 36, No. 1SS
Suicides, Persons 15–24 Years of Age	NCEHIC	1988; Vol. 37, No. SS-1
Summer Mortality	NCEHIC	1983; Vol. 32, No. 1SS
Syphilis	NCPS	1991; Vol. 40, No. SS-3
Toxic-Shock Syndrome	NCID	1984; Vol. 33, No. 3SS
Trichinosis	NCID	1991; Vol. 40, No. SS-3
Tubal Sterilization Among Women	NCCDPHP	1983; Vol. 32, No. 3SS
Tuberculosis	NCPS	1991; Vol. 40, No. SS-3
Water-Related Disease	NCID	1991; Vol. 40, No. SS-3

Abbreviations

NCCDPHP	National Center for Chronic Disease Prevention and Health Promotion
NCEHIC	National Center for Environmental Health and Injury Control
NCID	National Center for Infectious Diseases
CIO	Centers/Institute/Offices
NCPS	National Center for Prevention Services
EPO	Epidemiology Program Office
NIOSH	National Institute for Occupational Safety and Health

Special Focus II:
Public Health Surveillance
and
International Health
1992

with contributions from

Bela Johan National Institute of Hygiene, Budapest, Hungary
Department of Health, Philippines
Epidemiology Program Office, CDC
International Health Program Office, CDC
National Center for Chronic Disease Prevention
and Health Promotion, CDC
National Center for Environmental Health and Injury Control, CDC
National Center for Prevention Services, CDC
New Zealand Communicable Disease Centre

Respiratory Disease Surveillance in Hungary

Mary M. Agocs, M.D.*
Peter Rudnai, M.D.†
Ruth A. Etzel, M.D., Ph.D.*
*Division of Environmental Hazards and Health Effects
National Center for Environmental Health and Injury Control
Centers for Disease Control,
and †Bela Johan National Institute of Hygiene, Budapest, Hungary

Summary

In October 1989, the Hungarian National Institute of Hygiene initiated the Children's Acute Respiratory Morbidity (CHARM) Surveillance System to assess the association between nine reportable respiratory diseases and air pollution. The weekly number of physician-diagnosed, reportable respiratory diseases among four age groups of children (<1, 1–2, 3–5, and 6–14 years) was tabulated for Sopron, a city with 60,000 residents. We calculated the proportion of diseases occurring during weeks with low, moderate, and high sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) concentrations. The weekly averages of the 24-hour median SO_2 concentrations were divided into thirds at ≤17.6, >17.6 to ≤26.3, and >26.3 μg/m^3 (range: 0.9–79.6 μg/m^3), and the NO_2 concentrations at ≤29.8, >29.8 to ≤44.1, and >44.1 μg/m^3 (range: 4.2–90.1 μg/m^3). During 1990, 11,474 respiratory disease cases occurred among the 4,020 children <15 years of age living in Sopron and monitored by the CHARM system. The two most frequently reported disease categories were rhinitis/tonsillitis/pharyngitis (71.5%) and acute bronchitis (8.5%). Sixty-seven percent of pneumonia cases occurred when SO_2 concentrations were highest. We found no association between levels of NO_2 and respiratory diseases. The CHARM Surveillance System may characterize more fully which groups of children develop particular respiratory diseases following exposure to air pollution.

INTRODUCTION

Exacerbations of respiratory diseases such as asthma and bronchitis are associated in some communities with elevated ambient levels of sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone, and suspended particulates (*1–9*). The relationship between these respiratory diseases and air pollution can be more clearly defined by environmental-respiratory disease surveillance. Environmental-disease surveillance links surveillance data for respiratory diseases with data on air pollution so that the contribution of air pollution to changes in incidence of respiratory diseases can be assessed. The necessity for combining two data sources, with data often collected by different institutions, differentiates such systems from many other surveillance systems that collect only information characterizing the person and the disease.

Because such surveillance could monitor many people for long periods, the data can be useful in determining which respiratory diseases and their exacerbations are associated with air pollution; whether a pollutant or a combination of pollutants is

linked to particular respiratory diseases; and whether certain persons are especially at risk. In this paper we describe an environmental-respiratory disease surveillance system established in Hungary to assess the relationship between air pollution and respiratory disease among children. We present preliminary data from that surveillance system and examine factors for consideration when such systems are initiated.

METHODS

Surveillance data for respiratory diseases were obtained from Hungary's Children's Acute Respiratory Morbidity (CHARM) Surveillance System. In October 1989, scientists at the Hungarian National Institute of Hygiene (HNIH) initiated the CHARM System to elucidate the relationship between air pollution and respiratory diseases in children. The CHARM System currently monitors approximately 23% of all Hungarian children <15 years of age. Pediatricians' staff tabulate the weekly number of reportable respiratory diseases diagnosed by a participating physician among four age groups of children (<1, 1–2, 3–5, and 6–14 years of age). The weekly data are transmitted to county public health institutes; each institute then sends the collected data, along with local population data, to the HNIH in Budapest.

Using the *International Classification of Diseases* (ICD) (*10*), the HNIH established nine categories of reportable respiratory diseases: a) rhinitis, nasopharyngitis, coryza, catarrh, pharyngitis, or tonsillitis (ICD 460.0, 462, 463); b) otitis media or mastoiditis (382, 383); c) sinusitis (461); d) acute bronchitis (466); e) chronic bronchitis (491); f) laryngitis, tracheitis, laryngotracheitis, epiglottitis, or laryngopharyngitis (464, with the exception of 464.4, 465); g) croup (464.4); h) pneumonia and bronchopneumonia not due to influenza (480–486) and their complications, including empyema, pleuritis, pneumothorax, abscess, fibrosis, atelectasis, emphysema, or mediastinitis; or protein and rheumatoid pneumonitis (510–519); and i) asthma (diagnosed only among children ≥4 years of age) (493). Children with asthma who are taking medication are treated in respiratory clinics that do not participate in the CHARM System.

Routinely gathered air pollution data include 24-hour average concentrations of SO_2 and NO_2, measured on alternate days. SO_2 is absorbed from the air by aqueous potassium tetrachloromercurate. The resulting dichlorosulfitomercurate complex is reacted with pararosaniline and formaldehyde to form pararosaniline methyl sulfonic acid, which is measured spectrophotometrically at 540–580 nm (*11,12*). NO_2 is absorbed by aqueous triethanolamine solution and reacted with the Saltzmann reagent to form an azo-dye, which is measured spectrophotometrically at 530 nm (*12,13*).

In this paper, we present preliminary data from Sopron, a city with 60,000 inhabitants in northwest Hungary, which has a power plant, a foundry, and heavy automobile traffic. Sopron was selected because in 1988 the city ranked sixth among the 79 monitored Hungarian towns in SO_2 concentration (yearly average concentration, 30 $\mu g/m^3$) and second in NO_2 (yearly average concentration, 45 $\mu g/m^3$).

Because respiratory disease data are reported weekly, we determined the mean of the 24-hour average measurements taken at the four Sopron air monitoring stations to calculate weekly SO_2 and NO_2 concentrations. The pollutant concentrations were divided into terciles. We then compared the proportional distribution of respiratory diseases that occurred within each category.

RESULTS

During 1990, the overall annual median weekly concentrations were 22.0 $\mu g/m^3$ for SO_2 (range: 0.9–79.6 $\mu g/m^3$), and 37.6 $\mu g/m^3$ for NO_2 (range: 4.2–90.1 $\mu g/m^3$). We divided the distribution of SO_2 concentrations into thirds at 0.9 to 17.6, >17.6 to ≤26.3, and >26.3 to 79.6 $\mu g/m^3$ and NO_2 concentrations at 4.2 to ≤29.8, >29.8 to ≤44.1, and >44.1 to 90.1 $\mu g/m^3$. The high SO_2 concentration category included 11 of the 13 winter weeks.

For 1990, surveillance data for respiratory diseases were available from six of 10 pediatricians in Sopron whose practices included 4,020 children <15 years of age. There were 11,474 reported cases of respiratory disease among these children (Table 1). Children ages <1 year experienced fewer cases of respiratory diseases per child than did older children. Among all the age groups, increasing SO_2 concentrations were associated with an increasing proportion of respiratory disease (Table 2). In addition, the largest percentage of disease in each age group occurred when SO_2 concentrations were highest. No apparent association was found between increasing NO_2 concentration and respiratory disease (Table 3).

Eighty percent of all disease occurred in two categories: rhinitis/tonsillitis/pharyngitis and acute bronchitis. Levels of both disease categories increased as SO_2 concentrations increased (Table 4). Otitis/mastoiditis and asthma also increased in frequency with increasing SO_2 concentrations. Although the percentage of pneumonia

TABLE 1. Age distribution of children participating in the CHARM* Surveillance System and number of reported respiratory diseases — Sopron, Hungary, 1990

Age (years)	Population (yearly median) N	Population (yearly median) %	Respiratory diseases N	Respiratory diseases %	Diseases reported per child
<1	437	10.9	632	5.5	1.45
1–2	835	20.8	2,617	22.8	3.13
3–5	1,227	30.5	3,660	31.9	2.98
6–14	1,521	37.8	4,565	39.8	3.00
Total	**4,020**	**100**	**11,474**	**100**	**2.85**

*Children's Acute Respiratory Morbidity

TABLE 2. Frequency of respiratory diseases, by age group and sulfur dioxide concentration — Sopron, Hungary, 1990

	Sulfur dioxide concentration ($\mu g/m^3$)						
	Low (0.9 to ≤17.6) 18 weeks		Moderate (>17.6 to ≤26.3) 17 weeks		High (>26.3 to 79.6) 17 weeks		Total 52 weeks
Age (years)	N	%	N	%	N	%	N
<1	201	31.8	190	30.1	241	38.1	632
1–2	813	31.1	822	31.4	982	37.5	2,617
3–5	1,114	30.4	1,179	32.2	1,367	37.3	3,660
6–14	1,361	29.8	1,480	32.4	1,724	37.8	4,565
Total	**3,489**	**30.4**	**3,671**	**32.0**	**4,314**	**37.6**	**11,474**

cases did not reflect such a trend, 67% of the cases occurred when SO_2 concentrations were highest.

DISCUSSION

The data from Sopron are consistent with those from other studies that show an association between respiratory disease and exposure to SO_2 and its associated compounds (e.g., sulfates) (*1–3*). A major source of these pollutants is the combustion of fuel, in particular coal. The combustion of coal also produces particulate matter, another pollutant associated with respiratory disease (*3,9*). In Sopron, the suspended particulate concentration was not measured, and we could not assess its impact. Thus, the association we found between SO_2 and disease may, in part, be due to other pollutants for which SO_2 is a marker.

In Sopron, we found an association between average weekly SO_2 concentrations and certain respiratory diseases usually caused by viral or bacterial infections (e.g., rhinitis/tonsillitis/pharyngitis, acute bronchitis, and pneumonia). Exposure to air pollutants can cause inflammation and irritation of the respiratory system and possible damage to lung defense mechanisms; lung function and clearance may thereby be compromised. Thus, exposure to pollutants may directly cause disease or may increase susceptibility to bacterial or viral infection (*14–16*). Data gathered by environmental-respiratory disease surveillance in additional localities could more clearly define the association between infectious diseases and air pollution.

When such surveillance systems are being developed, careful consideration should be given to the collection of data for respiratory diseases, air pollution, and their linkage. In Hungary, surveillance data for respiratory diseases among children are gathered by pediatricians, which may also be feasible in other countries. However, records of admissions and discharges from hospitals and emergency rooms may be an alternative source that would provide information on persons likely to suffer from more severe respiratory diseases.

Initially, respiratory disease surveillance could accept a diagnosis given by a health-care provider as a true case. Subsequently, standard case definitions should be developed to minimize the possibility that providers diagnose the same disease differently. To ensure that data are comparable throughout the country, case definitions, which include objective markers for disease, should be developed at the national level.

TABLE 3. Frequency of respiratory diseases, by age group and nitrogen dioxide concentration — Sopron, Hungary, 1990

	Nitrogen dioxide concentration ($\mu g/m^3$)						
	Low (4.2 to ≤29.8) 18 weeks		Moderate (>29.8 to ≤44.1) 17 weeks		High (>44.1 to 90.1) 17 weeks		Total 52 weeks
Age (years)	N	%	N	%	N	%	N
<1	211	33.4	200	31.6	221	35.0	632
1–2	870	33.2	884	33.8	863	33.0	2,617
3–5	1,162	31.7	1,335	36.5	1,163	31.8	3,660
6–14	1,467	32.1	1,640	35.9	1,458	31.9	4,565
Total	**3,710**	**32.3**	**4,059**	**35.4**	**3,705**	**32.3**	**11,474**

Cross comparisons among countries should be carried out carefully, as diagnostic practices may vary.

Surveillance systems can be established to gather data on the population with or without personal identifiers. In the former situation, the data gathered should include the patient's date of birth, sex, race, ethnicity, place of residence, diagnoses, date of symptom onset, date of first diagnosis for chronic diseases, and date of examination by a health-care provider. The smoking status of the patient and of any household members would also be useful information. The demographic data may identify groups of persons at risk of disease and persons who seek care frequently for the same disease. Identification of those persons is essential to estimate the incidence of respiratory disease. The CHARM System in Hungary collects data without identifying the person with the respiratory disease. Thus, the number of children who seek care for a respiratory disease and the median number of diseases per ill child are not known. Because some children may never be brought to medical attention during the year, the number of cases per ill child in Sopron may have been higher than three. In the United States, the Cleveland Family Study conducted in that industrial city during the 1950s indicated that children <6 years of age had an average of seven respiratory illnesses per year (*17*).

Data on concentrations of air pollutants are routinely gathered in many countries (*16,18*). In Hungary, 24-hour average concentrations of SO_2 are measured at 353 stations, 24-hour average concentrations of NO_2 at 347 stations, and the monthly amount of settled dust at 692 stations (*19*). Following World Health Organization (WHO) recommendations, many countries have developed triads of monitors, placing one each in residential, commercial, and industrial areas of a city (*18*). WHO recommends that daily average NO_2 concentrations remain <150 $\mu g/m^3$ and daily SO_2 concentrations

TABLE 4. Frequency of respiratory diseases, by sulfur dioxide concentration — Sopron, Hungary, 1990

	Sulfur dioxide concentration ($\mu g/m^3$)							
	Low (0.9 to ≤17.6) 18 weeks		Moderate (>17.6 to ≤26.3) 17 weeks		High (>26.3 to 79.6) 17 weeks		Total 52 weeks	
Disease	N	%	N	%	N	%	N	%
Rhinitis/tonsillitis/ pharyngitis	2,491	30.4	2,736	33.4	2,972	36.2	8,199	71.5
Acute bronchitis	262	26.7	320	32.6	399	40.7	981	8.5
Acute laryngitis/ tracheitis	244	32.5	195	26.0	312	41.5	751	6.5
Chronic bronchitis	225	34.0	190	28.7	246	37.2	661	5.8
Sinusitis	126	32.6	96	24.8	165	42.6	387	3.4
Otitis/mastoiditis	112	30.2	114	30.7	145	39.1	371	3.2
Pneumonia	22	22.0	11	11.0	67	67.0	100	0.9
Asthma	4	28.6	4	28.6	6	42.9	14	0.1
Croup	3	30.0	5	50.0	2	20.0	10	0.1
All respiratory diseases	3,489	30.4	3,671	32.0	4,314	37.6	11,474	100

Note: Asthma is diagnosed only among children ≥4 years of age. Children with asthma who are taking medication are treated in a respiratory clinic that does not participate in the CHARM System.

<125 μg/m^3 when particulate matter is present (*16*). In the United States, the criteria pollutants (i.e., SO_2, NO_2, ozone, particulate matter <10 microns in diameter, carbon monoxide, and lead) are measured by each state, in accordance with uniform, rigid criteria established by the U.S. Environmental Protection Agency (*20*). National air monitoring sites are located where pollution concentrations are likely to be high and large numbers of persons are exposed. State and local air pollution control agencies also may operate additional monitors at other sites. In many counties, concentrations of additional air pollutants are measured during special circumstances (e.g., monitoring pollutants in specific industrial areas), which provides an opportunity to determine whether those pollutants are associated with respiratory disease.

Data on concentrations of air pollutants should be collected for the same population from which the respiratory disease data are obtained. Subsequent analysis of daily data may determine whether elevated pollutant concentrations are associated with an increased frequency of disease several days later. Weekly disease counts are useful because daily counts may be influenced by the effect of personal schedules on physician visits. The method of analysis should take into account the possible serial correlation in the counts of respiratory disease diagnoses from day to day. Because these observations may not be independent and random events, statistical methods that assume independence of events may be inappropriate. Therefore, it may be preferable to use statistical methods of analysis that can adjust for this time dependence. In addition, analysts of ecologic data (i.e., data describing a population rather than an individual) should consider the strengths and limitations of this type of data (*21*).

In our analysis, we divided the year into weeks with low, moderate, and high pollutant concentrations and found an association between increasing respiratory disease and increasing SO_2 concentrations. High SO_2 concentrations were also associated with the winter season (i.e., the high category included 11 of the 13 winter weeks). During the winter season, respiratory disease may be more common because of increased ambient air concentrations of pollutants that are respiratory irritants (e.g., SO_2 produced during heating). However, other factors, such as more time spent indoors in close contact, may contribute to the spread of respiratory infections during the winter. Ongoing surveillance, particularly in cities located in differing climates, can clarify the relationship between respiratory disease, air pollution, and the winter season.

Once an environmental surveillance system is implemented, it should be evaluated to determine its accuracy. In Hungary, the HNIH plans to evaluate the CHARM System. Of particular concern to HNIH is whether a child treated by a pediatrician is reported more than once during a single episode of respiratory disease. Reporting each visit would cause a falsely high number of respiratory diseases per child to be reported. The HNIH is analyzing data, and the information will be shared with the health-care providers. In Sopron, the providers will transmit the data to the mayor's office so that the information can be considered when the route of a new highway is determined.

Environmental-respiratory disease surveillance may establish causes for disease and can be used to monitor the impact of pollution control measures. In 1985 in Barcelona, Spain, respiratory disease surveillance was established in emergency rooms to determine the etiology of epidemic asthma in the city (*22,23*). The surveillance led to the discovery that asthma epidemics were associated with the unloading of soybeans in the city harbor. Further epidemics were prevented by placing filters on the harbor silos. In Hungary, pollution control measures that have already been imple-

mented include prohibiting automobiles with two-cycle engines, which burn oil mixed with gasoline and produce many exhaust pollutants, from being used as taxis in Budapest and banning their import as of January 1, 1992. Automobile exhaust must now be checked yearly and meet specified standards. Vehicles exceeding pollution standards may not be driven until corrective repairs have been made. Additional efforts are being made to decrease industrial emissions. The CHARM system can be used to monitor the impact of these policies on respiratory diseases among children.

Environmental-respiratory disease surveillance is likely to clarify the role that air pollution plays in causing respiratory diseases. Understanding the relationship between respiratory disease and air pollution will permit resources to be targeted at decreasing the most harmful pollutants. Analysis of respiratory disease surveillance data also can generate hypotheses regarding the mechanisms of disease and can better define persons at risk. Thus, future case-control or cohort studies can be better focused and more efficient. Surveillance can also allow an estimate of the personal and monetary costs of respiratory disease attributable to air pollution. These data can be valuable in developing future public service announcements to explain the relationship between respiratory diseases and air pollution, thus informing and educating the groups of persons most at risk for disease.

Acknowledgments

We thank Endre Sárkany, M.D., Department of Community Hygiene, HNIH, Budapest; Magda Kertész, Ph.D., Head, Dr. Tibor Várkonyi, Éva Vaskövi, Dr. Univ., Julianna Bácskai, Department of Air Hygiene, HNIH, Budapest; the CHARM Surveillance System pediatricians and public health institutes, especially Krisztina Barna, M.D., Chief Pediatrician, Sopron and the Györ-Moson-Sopron Public Health Institute; the Department of Epidemiology, HNIH, Budapest; and Lawrence E. Cohen, Environment, Science, and Technology Attaché, U.S. Embassy, Hungary.

References

1. Ostro BO, Lipsett MJ, Wiever MB, Selner JC. Asthmatic response to airborne acid aerosols. Am J Public Health 1991;81:694–702.
2. Zeidberg DL, Prindle RA, Landau E. The Nashville air pollution study: I. Sulfur dioxide and bronchial asthma, a preliminary report. Am Rev Respir Dis 1961;84:489–502.
3. Ware JH, Ferris BG, Dockery DW, Spengler JD, Stram DO, Speizer FE. Effects of ambient sulfur oxides and suspended particles on respiratory health of preadolescent children. Am Rev Respir Dis 1986;133:835–42.
4. Shy CM, Creason JP, Pearlman ME, McClain KE, Benson FB, Young MM. The Chattanooga school children study: effects of community exposure to nitrogen dioxide. J Air Pollution Control Assoc 1970;20:539–45.
5. Love GJ, Lan S, Shy CM, Riggan WB. Acute respiratory illness in families exposed to nitrogen dioxide ambient air pollution in Chattanooga, Tennessee. Arch Environ Health 1982;37:75–80.
6. Ponka A. Asthma and low level air pollution in Helsinki. Arch Environ Health 1991; 46:262–70.
7. Schwartz J, Spix C, Wichmann HE, Malin E. Air pollution and acute respiratory illness in five German communities. Environ Res 1991:56;1–14.
8. Bates DV, Sizto R. Air pollution and hospital admissions in Southern Ontario: the acid summer haze effect. Environ Res 1987;43:317–31.
9. Pope CA. Respiratory hospital admissions associated with PM_{10} pollution in Utah, Salt Lake, and Cache Valleys. Arch Environ Health 1991;46:90–7.
10. World Health Organization. International classification of diseases, eighth revision. Geneva: World Health Organization, 1969.
11. West PW, Gaeke GC. Fixation of sulfadioxide as disulfitomercurate and subsequent colorimetric estimate. Anal Chem 1956;28:1816–9.
12. World Health Organization. Selected methods of measuring air pollutants. Geneva: WHO Offset Publications, No. 24, 1976.

13. Saltzmann BE. Colorimetric microdetermination of nitrogen dioxide in the atmosphere. Anal Chem 1954;26:1949–54.
14. Douglas JWB, Waller RE. Air pollution and respiratory infection in children. Br J Prev Soc Med 1966;20:1–8.
15. Jaakkola JJK, Paunio M, Virtanen M, Heinonen OP. Low-level air pollution and upper respiratory infections in children. Am J Public Health 1991;81:1060–3.
16. World Health Organization. Air quality guidelines for Europe. WHO Regional Publications, European Series No. 23. Copenhagen: WHO Regional Office for Europe, 1987.
17. Dingle JH, Badger GF, Hordan WS. Illness in the home. Cleveland, OH: Case Western Reserve University, 1964.
18. World Health Organization. Assessment of urban air quality: report on the results of the WHO/UNEP programme on health-related environmental monitoring. Geneva: World Health Organization, 1988.
19. Kertesz M, Varkonyi T. Air quality control and air pollution surveillance in Hungary. WHO collaborating centre for air quality management and air pollution control. Bull WHO 1988 (December);3:1–2.
20. Environmental Protection Agency. National air quality and emissions trends report, 1989. Research Triangle Park, North Carolina: US Environmental Protection Agency, Office of Air Quality Planning and Standards, Technical Support Division, 1991.
21. Morgenstern H. Uses of ecologic analysis and epidemiologic research. Am J Public Health 1982;72:1336–44.
22. Anto JM, Sunyer J, Rodriguez-Roisin R, et al. Community outbreaks of asthma associated with inhalation of soybean dust. N Engl J Med 1989;320:1097–102.
23. Sunyer J, Anto JM, Murillo C, Saez M. Effects of urban air pollution on emergency room admissions for chronic obstructive pulmonary disease. Am J Epidemiol 1991;134:277–86.

Surveillance in Evacuation Camps After the Eruption of Mt. Pinatubo, Philippines

Maria Ruth S. Surmieda, M.D.
Grace Abad-Viola, M.D.
Ilya P. Abellanosa, M.D.
Florante P. Magboo, M.D.
Rio L. Magpantay, M.D.
Maria Luz G. Pascual, M.D.
Enrique A. Tayag, M.D.
Franklin C. Diza, M.D.
Juan M. Lopez, M.D.
Mary Elizabeth G. Miranda, D.V.M.
Robert A. Sadang, M.D.
Nancy S. Zacarias, M.D.
Felilia M. White, R.N.
Maria Concepcion R. Roces, M.D.
Mark E. White, M.D.
Manuel M. Dayrit, M.D., M.Sc.

Field Epidemiology Training Program,
Department of Health, Philippines

Summary

To obtain accurate, timely data on the health status of persons in evacuation camps after the eruption of the Mt. Pinatubo volcano, the Philippine Department of Health (DOH) conducted a survey of the health needs of the evacuees and established disease surveillance in each camp. Surveys of the camps revealed that sources of potable water, sanitary means of waste disposal, and shelters were inadequate. Disease surveillance showed that measles, acute respiratory infections, and diarrhea were the most important problems. Surveillance detected outbreaks of measles and an outbreak of vomiting and diarrhea in the camps. Deaths, primarily caused by measles (31%), diarrhea (29%), and respiratory infections (22%), totaled 349 in the first 12 weeks. Death rates peaked in the seventh week, when a death rate of 26/10,000 occurred among the Aetas, a tribe evacuated from the slopes of the volcano. The surveys guided the DOH in allocating supplies and medicine, while disease surveillance enabled disaster managers to monitor the effectiveness of health programs, identify high-risk groups, and respond appropriately to the situation.

INTRODUCTION

On June 15, 1991, Mt. Pinatubo on Luzon Island, Philippines, erupted, severely affecting the provinces of Pampanga, Tarlac, and Zambales (1990 combined population: 2,952,000). Initially, 113,921 residents were displaced; 106 evacuation camps were established in school buildings, tents, and public places in the three provinces, as well as in Manila, approximately 50 kilometers away. The group most severely affected were the Aetas, primitive tribes living on the slopes of the volcano. These nomadic people make up <1% of the population of the three provinces, but accounted for 22% of the evacuees who sought temporary shelter in the lowlands.

The immediate problems posed by disasters include the need to provide shelter, food, and adequate sanitation for the victims; to evaluate the health effects; and to make practical recommendations to the public in the affected areas. To respond effectively to the needs of disaster victims, relief managers and other decision makers need

timely, accurate, and relevant data. Reliable epidemiologic data are essential in organizing relief efforts by identifying high-risk groups and quantifying the needs of the evacuees (*1–3*).

METHODS

A survey to assess the health needs of the evacuees was done, and a disease surveillance system was established in each evacuation camp by the Field Epidemiology Training Program (FETP) of the Department of Health (DOH). The purpose of the surveillance system was to monitor disease trends and detect outbreaks so that intervention and preventive measures could be implemented promptly. Using standard case definitions, health workers recorded the number of consultations for and deaths associated with measles, diarrhea, acute respiratory infections (ARI), typhoid fever, malaria, dengue, and conjunctivitis.

Health workers (one of whom was on duty at all times) in each camp were instructed to collect surveillance data and forward reports to the Provincial Health Office, where designated personnel consolidated them. Daily reports were then relayed simultaneously to the Regional Health Office and FETP. After the surveillance data were analyzed, reports were given to the Secretary of Health and feedback was provided to the Regional Health Office, the Provincial Health Office, and the evacuation camps.

This report describes surveillance data for the first 12 weeks after the eruption.

RESULTS

The survey of the camps revealed that 94 (89%) of the 106 evacuation sites lacked adequate means of sanitary waste disposal, five (5%) lacked sturdy shelters, and two (2%) lacked potable water. There was also a need to vaccinate Aeta children, most of whom had not been vaccinated under the expanded program on immunization.

For the various diseases monitored, 74,962 consultations were recorded. The three most common diseases were diarrhea, 19,498 visits (26%); ARI, 18,973 visits (25%); and measles, 465 visits (1%). Disease surveillance detected outbreaks of measles in the evacuation camps and a foodborne outbreak of vomiting and diarrhea involving 23 evacuees at a camp in the National Capital Region.

During the 12-week period, 349 deaths occurred in the evacuation camps. Of these, 107 (31%) were due to measles, 101 (29%) to diarrhea, and 77 (22%) to respiratory infections (Table 1). Prior to the eruption, vital statistics records indicated that the death rate for lowlanders in the three provinces was 1/10,000/week. For Aetas, death rates prior to the eruption were estimated to be about 9/10,000/week, on the basis of an anthropologic study of other Aeta tribes in Luzon (*4*). Weekly death rates peaked at 7.7/10,000 evacuees in the seventh week. The death rate was higher among the Aetas, who had a rate of 26/10,000 that week, compared with the lowlanders, with a rate of <1/10,000 each week (Figure 1).

DISCUSSION

Surveys of evacuation sites conducted by FETP teams assessed the adequacy of food and water supplies, shelter, and latrines in each camp. This information helped relief managers to apportion available resources among the different sites. Surveil-

lance sites in each evacuation camp detected outbreaks early and enabled the DOH to respond immediately. As in previous disasters (*5,6*), data from active surveillance were useful in helping disaster managers respond to rumors and exaggerated fears of the public about epidemics following the disaster. Press releases by the DOH containing accurate and timely data from the surveillance system helped reassure the public that steps were being taken to prevent and control epidemics in the camps.

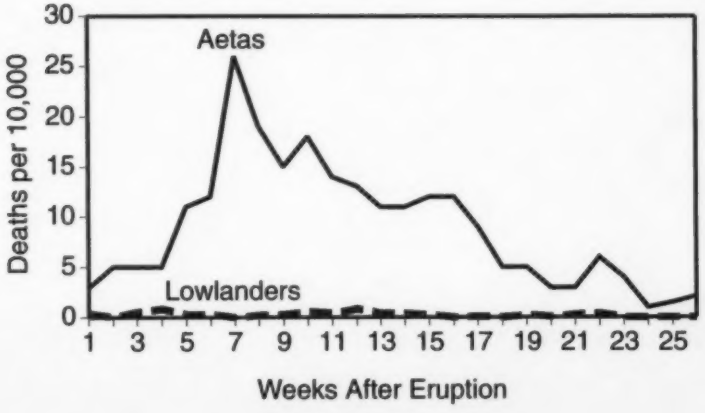
Disease surveillance in this disaster identified the Aetas as a high-risk group. Investigations of the measles epidemic revealed that most of the Aetas were not vaccinated against measles in time to prevent illness. Although camp managers were instructed to vaccinate children on admission to the camps, most of the Aetas refused to allow their children to be immunized. Many doses of vaccines were administered, but because master lists were not kept, managers were unaware that the same children were being vaccinated repeatedly. Although vitamin A was offered to some children, many did not receive it because health workers feared giving repeated doses, again because of a lack of master lists.

TABLE 1. Causes of morbidity and mortality in evacuation camps — Philippines, June 16–September 7, 1991

Diseases	Consultations (N=74,962)	Deaths (N=349)	CFR*
Diarrhea	19,498 (26%)	101	0.5%
ARI†	465 (1%)	107	23%
Measles	18,973 (25%)	77	0.4%
Other	36,026 (48%)	64	0.2%

*CFR = case-fatality ratio
† ARI = acute respiratory infection

FIGURE 1. Death rates in evacuation camps, by ethnic group — Philippines, June 16–December 14, 1991



Aeta tribe members were stunned by the volcanic eruption and had great difficulty adjusting to life in evacuation camps. Many were suspicious of lowlanders and refused to accept modern medicines, including vaccines. The basic problem in providing medical care to them seemed to be that medical teams rotated out of the camps too quickly to establish rapport with the Aetas and convince them to have their children vaccinated.

Because this surveillance system revealed that the Aetas were not being reached, anthropologists were requested to teach local health workers approaches for overcoming cultural barriers to accepting medical treatment. The Maternal and Child Health Service issued guidelines and procedures for emergency child care during disasters. The DOH also designed a project for the Aetas in the camps, and the U.S. Agency for International Development provided $700,000 for its implementation.

In the confusion after a disaster, it may be difficult for evacuation center managers to appreciate the importance of keeping basic records such as master lists, rather than simply counting the number of doses of vaccine or vitamin A administered. The measles outbreak reported here emphasizes the importance of maintaining master lists of evacuees.

After a disaster, epidemiologists can be most effective by using simple methods to collect relevant data, analyze them rapidly, and disseminate them quickly so that decision makers can take prompt action.

References

1. Glass RI, Dalia M, Nieburg P, Allegra DT. Organizing epidemiologic surveillance for a refugee population. In: Allegra DT, Nieburg P, Graba M, eds. Emergency refugee health care: a chronicle of the Khmer refugee-assistance operation, 1979–1980. Atlanta:CDC, 1984.
2. Toole MJ, Waldman RJ. Prevention of excess mortality in refugee and displaced populations in developing countries. JAMA 1990;263:3296–302.
3. Western KA. Epidemiologic surveillance after natural disaster. Bull WHO 1982;420:30–51.
4. Headland TN. Population decline in a Philippine Negrito hunter-gatherer society. Am J Hum Biol 1989;1:59–72.
5. CDC. Earthquake-associated morbidity and mortality—Italy. MMWR 1981;30:3–5.
6. CDC. Earthquake disaster—Luzon, Philippines. MMWR 1990;39:573–7.

Surveillance for Measles — New Zealand, 1991

Yvonne Galloway
Paul Stehr-Green, Dr.P.H.*
New Zealand Communicable Disease Centre
**National Center for Prevention Services,*
Centers for Disease Control
(on assignment to the New Zealand Communicable Disease Centre)

Summary

To monitor the extent and spread of the epidemic of measles that began in New Zealand in 1991, a special surveillance system was established. Reports from 13 area health boards were received on a weekly basis; the Bay of Plenty Area Health Board provided data aggregated over several weeks on a less frequent schedule. Nine thousand two hundred thirty-nine measles cases were reported during the 6-month period July–December 1991, with the highest incidence being reported from the Tairawhiti (1,027 cases/100,000 population) and Taranaki (558/100,000) Area Health Boards; South Island areas reported rates that were all below the national average of 280/100,000. Of the 8,684 cases for which information on age was obtained, over one-third (2,957, or 34%) occurred among children <5 years of age, most of whom had not been vaccinated. The failure to vaccinate a sufficiently high percentage of children against measles is the major factor that contributed to this epidemic.

INTRODUCTION

New Zealand comprises two large islands and several smaller islands in the western South Pacific Ocean, covering an area about the size of the state of California. The 1991 census identified approximately 3.4 million persons living in New Zealand, most of whom live on the North Island. Most of the population are of European descent; the principal minorities are the indigenous Maori and various other Pacific Islander groups. Health services (both curative and public health) are administered through 14 area health boards, which operate as autonomous agencies (Figure 1), with policy guidance and financial support provided through the New Zealand Department of Health.

Prior to 1991, the last major epidemic of measles in New Zealand occurred in 1985 (*1*). General practitioners (GPs) and other clinicians are not legally required to report cases of measles, and there is no routine surveillance for this disease. In mid-February 1991, an increase in the number of suspected cases of measles was first noticed in the Waikato Area Health Board, which is located in the central North Island. In March, an unexpectedly high number of cases was also noted in other North Island area health boards, including first Bay of Plenty and later Tairawhiti, Manawatu-Wanganui, and Wellington. To enable timely monitoring of the magnitude and extent of this growing epidemic, all area health boards were requested to begin collecting information on cases of measles beginning in July 1991. This report summarizes results from the first 6 months of this surveillance.

METHODS

For the purposes of surveillance, a case of measles was defined as the presence of a generalized maculopapular rash AND fever AND one or more of the following: cough, conjunctivitis, and coryza.

The methods for obtaining information about cases varied among the area health boards: in some, every GP in the region was contacted by the health board each week; other boards requested that all cases be notified to the Medical Officer of Health (i.e., the chief public health officer in each area health board), while others contacted a selected group of "sentinel" GPs weekly. Reports from 13 area health boards were received on a weekly basis; the Bay of Plenty Area Health Board provided data aggregated over several weeks on a less frequent schedule. These reports were collated and summarized, and the results were disseminated by the New Zealand Communicable Disease Centre (NZCDC), which is part of the Department of Health.

RESULTS

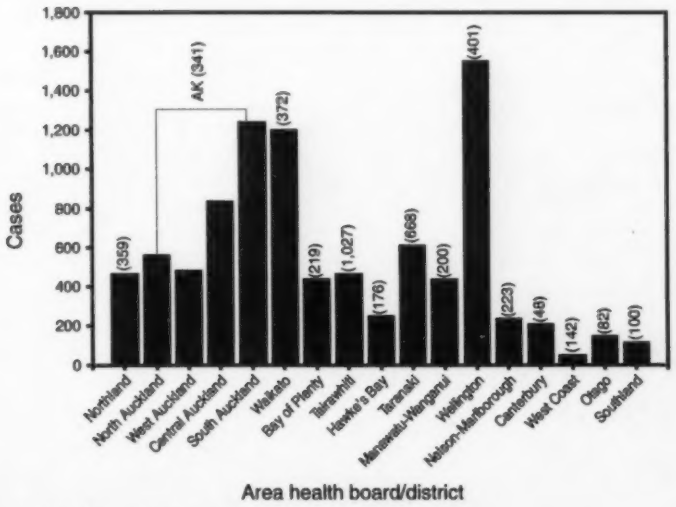
Nine thousand two hundred thirty-nine measles cases that met the clinical case definition were reported to NZCDC during the 6-month period July–December 1991; at least 345 of these cases were serologically confirmed (i.e., either by the detection of measles-specific IgM antibody titers in serum specimens or by the detection of a four-fold or greater increase in IgG antibody titers between acute- and convalescent-phase

FIGURE 1. New Zealand area health boards, as of December 1989

serum specimens). The reported incidence of measles peaked in July, with a secondary but smaller peak in September. During the latter half of 1991, the measles epidemic spread principally throughout the North Island and to the Nelson-Marlborough Area Health Board, which is located in the northernmost part of the South Island; other South Island area health boards reported comparatively few cases. The largest number of cases was reported from the four districts in the Auckland Area Health Board (3,102 cases); however, the highest incidences were reported from the Tairawhiti (1,027 cases/100,000 total population) and Taranaki (558/100,000) Area Health Boards (Figure 2). South Island areas reported rates that were all below the national average of 280/100,000.

Of the 8,684 (94% of the total) cases for which information on age was obtained, more than one-third (2,957, or 34%) occurred among preschoolers (i.e., children <5 years of age), including 10% among infants <1 year of age. Adolescents and young adults (i.e., 10–19 years old) accounted for 37% of cases, and adults >19 years of age accounted for 6% of cases (Table 1). Although the overall number of cases declined during the 6-month period in all age groups, the age distribution of reported cases varied throughout the period. In July, 37% of cases were among preschoolers and 34% among adolescents and young adults; in contrast, in September, preschoolers accounted for only 18% of cases and adolescents/young adults for 46%; this shift corresponded closely with the occurrence of localized outbreaks in high schools reported during the same period.

FIGURE 2. Reported measles cases, by area health board/district — New Zealand, July–December, 1991



()=Cases per 100,000 population

In the first 6 months during which surveillance data were collected, four measles-associated deaths were reported to the NZCDC. Three were among preschoolers (one of whom was <1 year of age) and the other person who died was a 12-year-old; all four had not been vaccinated. Two hundred thirty hospitalizations for measles-related complications were also reported to NZCDC during this period.

DISCUSSION

Given the noncomprehensive nature of the surveillance activities and based on extrapolation from school absentee records, the actual number of cases may have been three to four times as large as the number that was reported during July–December 1991. Similarly, the actual number of hospitalizations was probably higher than the figure reported through these surveillance activities during the latter half of 1991. In comparison, during the last measles epidemic in New Zealand in 1985, which was largely confined to Auckland and surrounding areas, there were 434 hospital admissions for measles-related complications. More than half (51%) of all reported hospitalizations were among preschoolers, with infants <1 year of age accounting for 22% (*3*).

The overall decrease in the number of measles cases over this 6-month period probably reflects depletion of the pool of non-immune persons that had grown over the previous 6 years and, to some extent, the effects of outbreak control measures that were implemented in some areas. The shift in peak incidence to older age groups during this same period may reflect spread of the epidemic to the smaller pool of previously vaccinated adolescent/young adult susceptibles (whether from failure to develop antibodies, i.e., "primary" vaccine failure, or waning of protective antibodies, i.e., "secondary" vaccine failure) after the larger pool of susceptible preschool-aged children, most of whom were unvaccinated, had been exhausted.

Based on historic information and data collected during this epidemic, the principal factor contributing both to this epidemic and to the regular cycle of measles epidemics in New Zealand is probably the failure to vaccinate a sufficiently high percentage of children against measles at 12–15 months of age. Further evidence to support this conclusion is provided from the first immunization coverage survey ever conducted in New Zealand, which was completed in the Hawke's Bay Area Health Board in July 1991. This survey showed that only 61% of children in Hawke's Bay received measles vaccine (or measles-mumps-rubella [MMR] vaccine, which replaced single-antigen measles vaccine in the recommended schedule in November 1990) by 16 months of

TABLE 1. Reported measles cases, by age group* — New Zealand, 1991

Age group	Number of cases	Percentage distribution	Attack rate (per 100,000)
≤4 years	2,957	34%	1,129.9
5–9 years	2,028	23%	814.8
10–14 years	1,808	21%	693.0
15–19 years	1,394	16%	457.2
≥20 years	497	6%	22.2
Total	**8,684**	**100%**	

*Age group was not known for 555 case-patients.

age (*4*). By the time these children had reached their second birthday, measles/MMR vaccination coverage had increased to 82%, but even this rate is still inadequate to effectively control the transmission of measles. A nationwide vaccination survey is under way to evaluate the level of vaccination coverage among preschool-aged children, to identify geographic areas and population subgroups at greatest risk of not being vaccinated, and to gain insights into parents' knowledge, attitudes, and behaviors regarding childhood immunizations.

In addition to the failure to achieve high vaccination coverage levels, there is evidence from this epidemic that primary and/or secondary vaccine failure also contributed, especially among older persons. To address this problem, the New Zealand Department of Health recently announced a two-dose schedule for MMR vaccination, with the first dose to be administered at 12–15 months of age and the second to be given to all children at Form 1 (i.e., at approximately 11 years of age), instead of the current practice of giving single-antigen rubella vaccine to Form 1 girls only. Achieving the optimum effect from this immunization program, however, will require the development and implementation of strategies to improve immunization levels by reducing barriers to vaccination (whether financial, logistic, or sociocultural), taking advantage of all opportunities to vaccinate, and using innovative and acceptable vaccine delivery techniques (including effective reminder/recall systems).

The rapid response and commitment of area health board staff, GPs, and other clinicians in implementing these surveillance activities enabled public health officials to better monitor the course of the epidemic and, with this information, to plan and implement effective interventions. Nonetheless, ongoing surveillance will be required to provide a continuing source of timely, representative information to guide decision-making. Therefore, it has been proposed to make measles a legally notifiable disease so that future outbreaks can be recognized early, thereby avoiding the delays in initiating interventions that were experienced during the most recent epidemic. It has also been recommended that standard response protocols be developed and widely distributed so that appropriate intervention/control efforts can be implemented rapidly when outbreaks are recognized. Finally, commitment to these surveillance and outbreak control activities should be encouraged; adequate financial and professional resources will have to be made available by area health boards and the Department of Health to ensure their success.

References

1. Hardy RB, Lennon DR, Mitchell EA. Measles epidemic in Auckland, 1985–86. NZ Med J 1987;100:273–5.
2. CDC. Measles—United States, 1990. MMWR 1991;40:369–72.
3. National Health Statistics Centre. Hospital and selected morbidity data, 1985. New Zealand: Department of Health, 1986.
4. Stehr-Green PA, Briasco C, Baker M, Trotter P. How well are we protecting our children: results of the immunization coverage survey in the Hawke's Bay Area Health Board. NZ Med J (in press).

Development of Health Surveillance in Togo, West Africa

Michael J. Toole, M.D.*
T. Karsa, M.D.†
Brian Fitzgibbon*
Kelly Bussell*
*International Health Program Office
Centers for Disease Control;
†Epidemiology Division, Ministry of Health, Togo

Summary

Since 1988, the Ministry of Health (MOH) of Togo, with technical assistance from CDC, has systematically adapted and strengthened its health information system (HIS) to enable improved monitoring of trends in diseases. The previous system had been hampered by complicated, lengthy reporting forms; incomplete and delayed receipt of reporting forms; absence of mortality reporting; slow, cumbersome manual compilation and analysis methods; and lack of standard case definitions. To simplify the adaptation process, the system was divided into three main activities: data collection, data compilation and analysis, and dissemination of reports and follow-up action. Public health authorities in Togo have built on existing strengths and successfully adapted the HIS to focus on national morbidity and mortality prevention priorities.

INTRODUCTION

Health surveillance focuses on the collection, analysis, dissemination, and use of data related to the occurrence of—and deaths from—diseases of public health importance. Surveillance is a major component of a health information system (HIS) and is critical in evaluating the **impact** of disease control programs. The other component of an HIS consists of data related to the **process** of program implementation, such as statistics on access, coverage, and service quality. This report describes the evolution of a national HIS in a West African country during 1986–1991.

BACKGROUND

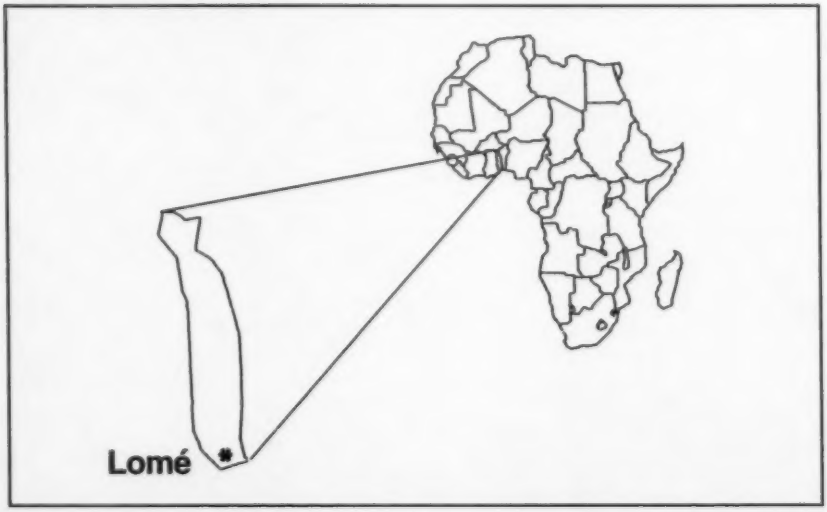
Togo has a population of approximately 5 million; the national capital is Lomé (Figure 1). The responsibility for health information management has been assigned to the Health Statistics Unit of the Ministry of Health's Epidemiology Division. Since 1988, the Ministry of Health (MOH), with technical assistance from CDC, has systematically adapted and strengthened its HIS to enable improved monitoring of trends in diseases that are the focus of national control programs. These improvements have been supported by the Combatting Childhood Communicable Diseases (CCCD) Project, funded by the United States Agency for International Development.

The MOH established the following objectives for the Togo national HIS:

a) to collect information on the occurrence of diseases of public health importance from all outpatient health clinics (including hospitals) on a monthly basis;
b) to ensure the prompt reporting of cases of diseases of epidemic potential (e.g., cholera, yellow fever, and meningitis);
c) to collect information on mortality from as many existing sources as possible;
d) to collect appropriate demographic data to permit the calculation of disease-, age-, region-, and gender-specific morbidity and mortality rates;
e) to systematically collect information pertaining to program indicators, such as immunization coverage, through routinely reported service statistics;
f) to periodically gather information relating to coverage and impact achieved by disease control interventions through population surveys;
g) to publish and widely disseminate regular bulletins on disease morbidity and mortality trends; and
h) to publish annual, comprehensive reports containing information on trends of diseases of public health importance and on program indicators.

Although the adaptation of the national HIS was designed to focus on information related to the prevention of morbidity and mortality from childhood communicable diseases (such as diarrheal diseases, malaria, measles, pertussis, and tetanus), the system was intended to be sufficiently flexible to enable trends to be followed in other endemic diseases.

FIGURE 1. Republic of Togo



MAJOR ACHIEVEMENTS

To simplify the adaptation process, the system was divided into three main activities: data collection; data compilation and analysis; and dissemination of reports and follow-up action. An assessment of the system in 1988 identified the following major problems:

- complicated, overlengthy outpatient morbidity reporting forms;
- incomplete, delayed receipt of reporting forms by the central statistics unit;
- absence of mortality reporting;
- slow, cumbersome manual compilation and analysis methods;
- lack of standard case definitions;
- inadequate, irregular supervision of the peripheral health personnel responsible for routine reporting;
- lack of integration of data from diverse sources pertaining to specific diseases;
- delayed publication of annual reports (up to 3 years after the end of the reporting year).

DATA COLLECTION

Outpatient Morbidity

Because the routine outpatient reporting system was already functioning relatively well in 1988, with monthly reports received regularly from at least 70% of outpatient clinics, initial efforts focused on this activity. An improved, simplified reporting form was developed through a process of consensus among disease control program managers, district health officers, and clinicians. After a 1-year pilot period, the form was modified again in response to comments and suggestions from clinic personnel. The modified reporting form contained <40 conditions, classified according to age and gender of the patient, reduced from the former total of 70 conditions.

Supervision schedules were developed whereby central MOH staff visited each of the 21 districts on a regular basis, and district medical officers were trained in methods of supervision of data collection at peripheral health facilities. A simple system was developed to track incoming monthly report forms, and tables were published in annual reports indicating the proportion of expected reports actually received from each district, thus encouraging competition between districts. In 1990, 96% of expected monthly reports were received at the central level, ranging by district from 85% to 100%. Although draft case definitions were developed for review by the public health community, the only standard definition approved at the central level has been that for malaria.

Hospital Inpatient Morbidity and Mortality

After initial efforts had concentrated on routine morbidity reporting in outpatient clinics, a decision was made by the MOH in 1989 to extend routine reporting to hospital inpatient wards. In addition to morbidity, data on hospital-based deaths were

reported. A simple form was developed for recording the following information on each person hospitalized: hospital department (medical, surgical, obstetric, etc.), age, gender, duration of hospitalization, discharge diagnosis, and outcome (cured, deceased, left against medical advice, or transferred). By the second year of operation, the hospital reporting system had achieved a completeness rate (proportion of expected monthly reports actually received at the central level) of more than 90%. The addition of hospital reporting to the national HIS enabled the MOH to monitor trends in case-fatality ratios (CFRs) or diseases of public health importance. The CFR is a critical impact indicator for interventions that aim to decrease mortality rather than morbidity (e.g., malaria and diarrheal disease control programs).

Data Compilation and Analysis

Major improvements in the efficiency of data compilation and analysis were achieved through computerization at the central level. Initial data entry programs written in DBase led to streamlined central data management; however, extensive errors were made in the data entry process during the first 3 years. Later, a menu-driven program with verification checks, developed by using Epi Info, Version 5 (*1*), has decreased the rate of data entry errors. Togolese computer programmers were trained under the auspices of the CCCD project in Kinshasa, Zaire, and by a CDC computer specialist in Togo. Computer hardware, initially provided by the CCCD project, was maintained and serviced by local contractors. The MOH aims to gradually decentralize data entry and analysis to the regional capitals in order to promote local, information-based health program planning and management. This process has begun on a pilot basis in two hospitals where computers have been installed and information managers have been trained. Prior to 1989, annual reports had consisted of long tables of diseases by age and gender; however, since that year, annual trends in diseases of public health importance have been analyzed, published as graphs, and annotated with comments by MOH epidemiologists. Morbidity data related to diseases of public health importance are now analyzed routinely by age, gender, and region to allow program managers to better focus their disease control efforts on groups in the community at high risk.

Data Dissemination and Action

The major consequence of accelerated data management has been the ability of the MOH to publish annual reports soon after the end of the reporting year. Thus, since 1988, annual reports have been published in April of the following year. In addition to morbidity and mortality data, certain process indicators, such as coverage statistics, have been compiled and published in the same report. For example, the epidemiology of measles has changed from a pattern of annual major epidemics to one of smaller annual peaks and periodic epidemics. This has been associated with gradually increasing measles vaccination coverage among young children (Figure 2).

Data generated by the national HIS have been used to design appropriate operational research studies. Although hospital deaths have been reported nationally only since 1989, the Pediatrics Department of the University Hospital Center in Lomé has maintained such data since 1984. The apparent temporal association between malaria and deaths from anemia among children <15 years of age in the period 1987–1990 at this hospital led to a focused study of a possible causal relationship between child-

hood malaria infection and anemia (Figure 3). This dynamic use of health data to improve overall understanding of the epidemiology of endemic diseases has been actively fostered in Togo.

Hospital morbidity and mortality reporting has provided new categories of information for use by decisionmakers in the Togolese health sector and has allowed for more rational allocation of resources within the hospital system. For example, only since 1989 has there been nationally compiled information on morbidity and mortality due to obstetric and gynecologic conditions. Health-care planners now have access to data on the most common causes of death in obstetric wards (Figure 4).

Problem Solving

The prompt analysis of annual data and the ability of information managers to disaggregate data by source have provided a valuable tool in monitoring the quality of data collection. For example, the 1989 outpatient morbidity data revealed an abrupt and unexpected increase in reported cases of malnutrition (Figure 5). Disaggregation by reporting source indicated that most of the increase could be explained by the large number of cases reported from a single site (Clinic A). A field visit to Clinic A by the MOH revealed that cases had been misclassified. Clinic staff were then trained in correct diagnosis; some improvement resulted in 1990, although Clinic A still reports 80% of the cases of malnutrition in the country.

FIGURE 2. Measles cases and measles vaccination coverage by month — Togo, 1984–1990

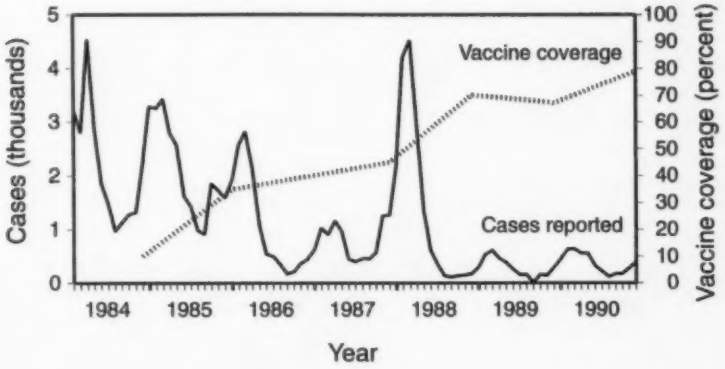
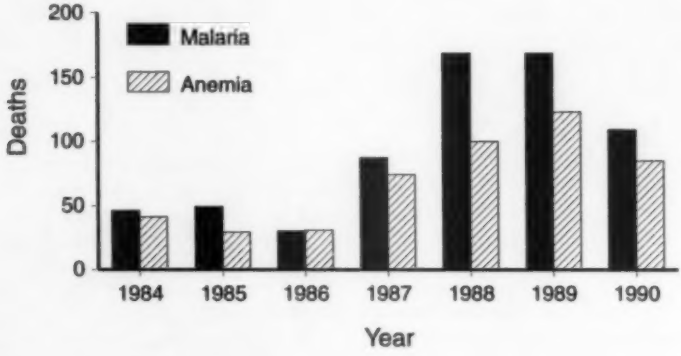
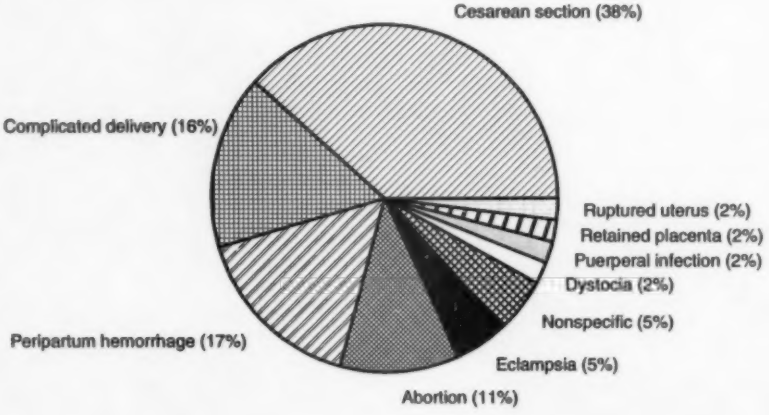


FIGURE 3. Pediatric* deaths due to malaria and anemia in University Hospital — Lomé, Togo, 1984–1990



*Pediatric=children <15 years of age

FIGURE 4. Main causes of death in all hospital obstetric and gynecologic wards — Togo, 1989

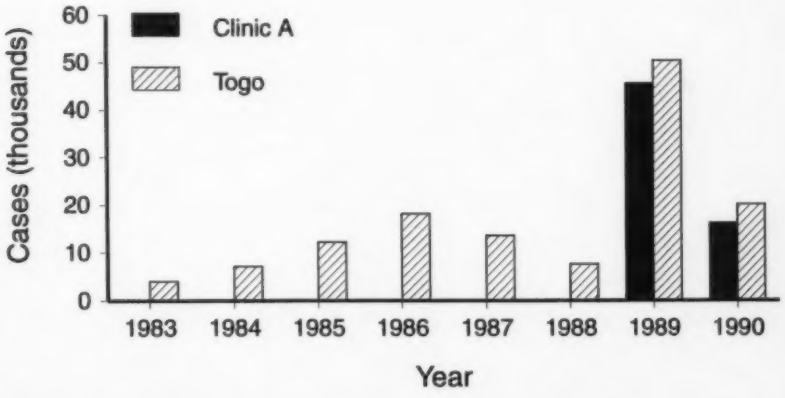


CONCLUSIONS AND FUTURE DIRECTIONS

Public health authorities in Togo have built on existing strengths and successfully adapted the HIS in order to focus on national morbidity and mortality prevention priorities. Meanwhile, the system has retained sufficient flexibility so that trends can be detected in conditions that were not previously the target of specific control efforts. The computerization of data management has enabled prompt analysis and publication of reports, and the presentation of data has been modified so that program managers may readily interpret trends and modify their programs as necessary. At this stage in its evolution, the following steps need to be taken to further improve the quality and usefulness of the national HIS.

- First, greater efforts are needed to improve and maintain the quality of data. For example, standard case definitions for diseases of public health importance need to be agreed upon and widely disseminated.
- Second, routine reporting of both morbidity and mortality needs to be supplemented with population-based death reporting and periodic mortality surveys.
- Third, certain disease-specific control programs still maintain separate reporting systems; ideally, all such systems should be integrated into the national HIS.
- Fourth, field supervision and training of district health officers in data collection and management need to be strengthened.

FIGURE 5. Malnutrition among children <5 years of age in Clinic A and Togo, 1983–1990



- Fifth, data on health service quality and coverage should be collected and compiled on a regular basis through standard questionnaires completed during routine supervisory clinic visits; these data should be integrated into annual reports.
- Finally, more frequent dissemination of selected surveillance information might be achieved through the routine publication of an epidemiologic bulletin.

Given the progress made by the Togolese MOH in adapting the national HIS to the needs of program planners and public health practitioners, the system should serve as a model for HIS development in other countries in the region.

Reference

1. Dean AD, Dean JA, Burton JH, Dicker RC. Epi Info, Version 5: a word processing, database, and statistics program for epidemiology on microcomputers. Atlanta: Centers for Disease Control, 1991.

Sexual Experience and Use of Contraception Among Young Adults in Latin America

Leo Morris, Ph.D.
Division of Reproductive Health
National Center for Chronic Disease Prevention and Health Promotion
Centers for Disease Control

Summary

Although a formal public health surveillance system has not yet been established in Latin America to document the attitudes of young people toward sex education, sexual activity, and contraception and their behaviors in these areas, representative data are available from 12 household-based Young Adult Reproductive Health Surveys conducted in seven countries since 1985. The surveys indicate that the rate of sexual experience before marriage or consensual union for males is much higher than that for females, and first sexual experience occurs at a younger age for males than for females. However, from 34% to 90% of females 20–24 years of age report having had premarital sexual relations. No more than 41% of females and 31% of males report that they or their partner used contraception at first sexual experience. Less than one-third of both young men and young women could identify the most fertile period during the menstrual cycle. The results of such surveys have provided program officials and policymakers with data to plan, implement, and evaluate interventions targeted for young adults.

INTRODUCTION

In Latin America, interest has recently intensified in the public health issues associated with fertility among teenagers, including concerns about early childbearing, unintended pregnancies, and the relatively high rate of premarital conceptions (*1–4*). In addition, sexually transmitted diseases (including human immunodeficiency virus [HIV] infection) are a growing public health concern. Representative sample surveys in Latin America—directed at young people to document their attitudes toward sex education, sexual activity and contraception, their history of sexual experience, and use of contraception—have been rare. To date, in many localities it has not been possible to design and implement ongoing public health surveillance systems for these behaviors on which to base public health-care and policy decisions.

Most investigations among teenagers have been conducted by using clinic populations or school populations as study groups. Unfortunately, these populations are not representative of the general population. Throughout Latin America, the rate of school attendance varies, and the dropout rate for young people before they enter secondary school is high in many areas. Researchers are aware that information obtained through school-based efforts does not fully represent all young people.

In efforts to obtain representative data on young adults, both male and female, Young Adult Reproductive Health Surveys (YARHS) have been conducted since 1985 in Jamaica, Costa Rica, and 10 cities in five other Latin American countries, with tech-

nical assistance and coordination provided by CDC's Division of Reproductive Health (*5–13*). Limited data about sexual experience and contraceptive use among young adults are also available from national family planning/maternal-child health surveys recently conducted in Panama, Brazil, Paraguay, Honduras, El Salvador, and Haiti (*14–18*). In these six national surveys, a special module for 15- to 24-year-old respondents was added to obtain information about premarital sexual experience and use of contraception at first sexual experience. Such information is not usually obtained in this type of survey. The module, which consisted of nine questions, was patterned after the YARHS survey instrument. Data are available for females only.

At present it has not been determined whether policymakers and legislators will, in the near future, allocate the resources needed to establish surveillance networks in their jurisdictions. They are aware that the health and social problems described in this report represent a burden on their health-care systems and on their populations; however, many priorities compete for, in most areas, extremely limited funds and trained personnel to allocate to programs that are long-term and prevention oriented, rather than immediate and responsive to acute problems. The U.S. Youth Risk Behavior Surveillance System provides a model for such surveillance systems, and the results of surveys such as those described below will provide data to support establishing such systems in Latin America and to serve as baseline data (*19*).

METHODS

Personal interviews were conducted with multistage, area-probability household samples of men and women 15–24 years of age (14–24 in Jamaica); the interviews were conducted by trained interviewers of the same sex as the respondents. Each interview lasted an average of 25 minutes. Data for male and female respondents were analyzed independently. The interview focused on previous formal or informal courses on sex education and their content, attitudes toward sex education, sexual activity and family planning, fertility, history of sexual experience, and use of contraceptives, as well as a wide range of social, economic, and demographic characteristics. In some surveys, a special module on knowledge of transmission and prevention of acquired immunodeficiency syndrome (AIDS), or HIV infection, was added.

The data presented in the sections that follow focus on the comparative results for premarital conceptions, sexual experience, and contraceptive use from these 18 surveys. An overview of the data available from each survey is presented in the tables. Those interested in more detailed information are encouraged to consult the original survey reports cited in the references.

RESULTS

These surveys provide documentation that a substantial proportion of married women (or women in consensual union) 15–24 years of age had premarital conceptions. Marriage in many cases was probably precipitated by a premarital pregnancy (Table 1). In Mexico City and Central America, 22%–42% of ever-married women 15–24 years of age who have had at least one live-born infant had premarital conceptions. In South America, this proportion ranges from a low of 25% in Guayaquil, Ecuador, to

63% in Santiago, Chile, the highest reported rate in Latin America. The second highest rate (59%) was reported in Haiti.

Only information on first births is generally known in these surveys, and data on pregnancies ending in abortion are either not known or underreported. For this reason and the possible misreporting of birth dates to conceal premarital conception, actual premarital conceptions are likely to be higher than implied by the data in Table 1.

For unmarried women reporting at least one pregnancy, from half to two-thirds of first pregnancies were reported as unintended in Haiti, Mexico City, Costa Rica, and Brazil; in Jamaica and Quito and Guayaquil, Ecuador, 75% of first pregnancies were reported as unintended (data not shown).

The proportion of 15- to 19-year-old females reporting premarital sexual intercourse was fairly similar in 10 of the 11 countries with data (Table 2). From 12% to 27% of 15- to 19-year-olds reported premarital sexual intercourse. In Mexico City and Central America, the range is 12% to 22%. The exception is Jamaica, where the social and cultural context is different from that in the Spanish- and Portuguese-speaking countries. For the 20- to 24-year-old age group, premarital sexual experience ranges from 32% in El Salvador to 64% in Haiti. Four of the five cities in Brazil and Santiago, Chile, also have rates >54%. Sexual experience is almost universal in this age group in Jamaica. The mean age at first premarital intercourse ranges from 15.6 to 17.9 years of age, with the male partner generally 4–6 years older.

Reported premarital sexual experience among young males is much higher than among females, with rates >85% for 20- to 24-year-olds in 11 of 13 countries or cities with data for males (Table 3). There is a wider range of premarital sexual experience reported by 15- to 19-year-olds—from 30% to 78%. The mean age at first premarital

TABLE 1. Percentage of first births that were premaritally conceived,* ever-married† females 15–24 years of age — selected countries, Latin America

Country (City)	Year of survey	Before union	First 7 mos. of union	Total premarital conceptions
Haiti	1989	41.4	16.9	58.7
Mexico City	1985	10.6	20.5	31.1
Guatemala City	1986	9.9	32.4	42.3
San Salvador, El Salvador	1988	8.6	13.3	21.9
Costa Rica§	1991	11.2	22.3	33.5
Panama	1984	23.7	14.6	38.3
Ecuador				
Guayaquil	1988	11.1	13.4	24.5
Quito	1988	17.3	17.3	34.6
Brazil	1986	8.0	25.8	33.8
Recife	1989	23.8	27.9	51.7
Salvador	1987	23.4	29.3	52.7
Rio de Janeiro	1989	20.8	28.0	48.8
Sao Paulo	1988	13.4	31.7	45.1
Curitiba	1989	9.1	30.1	39.2
Paraguay	1987	18.2	15.0	33.2
Santiago, Chile	1988	21.1	41.5	62.6

*Comparison of date of first birth and date of first marriage or consensual union.
† Ever in union.
§ Preliminary data.

TABLE 2. Percentage of 15- to 24-year-old females reporting premarital sexual intercourse, by age group — selected Latin American countries

Country (City)	Year of survey	Age (%)		Mean age at first intercourse (years)		No. of cases	
		15–19	20–24	Females	Partner	15–19	20–24
Haiti	1989	22.7	63.9	NA	NA	423	347
Jamaica	1987	55.4	90.5	15.6	19.7	1,046	892
Mexico City	1985	13.4	39.1	17.0	20.6	876	705
Guatemala City	1986	12.4	35.7	16.7	21.6	405	294
El Salvador	1988	15.7	32.3	16.4	NA	753	765
Costa Rica*	1991	21.7	39.9	16.5	21.7	845	737
Panama	1984	14.2	37.4	16.7	NA	1,648	1,604
Ecuador							
Quito	1988	11.9	33.8	17.4	21.6	404	399
Guayaquil	1988	18.4	42.7	16.7	22.2	474	379
Brazil	1986	13.9	36.5	16.6	NA	1,318	1,168
Recife	1989	15.7	38.9	16.8	21.8	578	411
Salvador	1987	20.1	54.7	17.2	22.4	508	448
Rio de Janeiro	1989	27.5	61.2	16.8	21.2	462	369
Sao Paulo	1988	26.6	57.6	16.9	21.6	443	361
Curitiba	1989	23.7	55.8	17.2	22.0	476	437
Paraguay	1987	21.2	48.7	16.9	NA	388	493
Santiago, Chile	1988	19.1	56.5	17.9	21.4	488	377

*Preliminary data.
NA: Not available.

TABLE 3. Percentage of 15- to 24-year-old males reporting premarital sexual intercourse, by age group — selected Latin American countries

Country (City)	Year of survey	Age (%)		Mean age at first intercourse (years)		No. of cases	
		15–19	20–24	Males	Partner	15–19	20–24
Haiti	1989	30.4	63.0	NA	NA	334	261
Jamaica	1987	78.1	96.8	12.7	13.3	1,090	786
Mexico City	1985	43.5	85.7	15.7	18.4	793	609
Guatemala City	1986	64.5	87.3	14.8	20.1	327	244
Costa Rica*	1991	41.5	76.0	15.3	18.1	781	624
Ecuador							
Quito	1988	58.5	97.1	15.1	18.0	412	350
Guayaquil	1988	63.9	94.0	14.8	21.0	449	349
Brazil							
Recife	1989	68.7	92.7	15.1	12.1	674	480
Salvador	1987	73.2	93.8	14.8	17.4	500	371
Rio de Janeiro	1989	73.2	94.3	15.0	17.6	447	401
Sao Paulo	1988	72.9	94.3	14.9	16.9	398	352
Curitiba	1989	56.3	93.7	15.4	17.0	524	426
Santiago, Chile	1988	47.6	85.7	16.0	18.5	435	364

*Preliminary data.
NA: Not available.

intercourse ranges from 12.7 in Jamaica to 16.0 years in Santiago. For males, first partners are also older—from an average of 0.6 years older in Jamaica to 6.2 years older in Guayaquil. This difference was more notable for young males <18 years of age at first intercourse (not shown). At first intercourse, younger males, upon initiating sexual activity, may be more likely than older males to seek out older females who are already sexually experienced.

From 10% to 22% of females in Latin countries had their first premarital intercourse at <15 years of age, compared with 30% in Jamaica. Sexual experience begins earlier for men. About one-fourth (26%–27%) of sexually experienced males in Haiti, Mexico City, and Santiago, 31%–45% in other Latin cities/countries, and 72% in Jamaica report that their first experience was before age 15. By age 19, at least 91% of sexually experienced males in each country have had their first intercourse. For females, especially, these are obviously crude average figures and comparisons between countries have to be interpreted with caution because marriage truncates the exposure of women who marry or enter a union at an earlier age. To determine the rate of initiating premarital sex at a specific age and to adjust the data for the censoring effect of age at marriage, life-table procedures, also called hazard models, are better suited to compare risks between populations or across time (*20*). An independent analysis is currently under way in which hazard models are used to study the data provided by these surveys (Hernandez, unpublished data).

Forty-one percent of females in Jamaica reported that they or their partner used contraception at first premarital intercourse (Table 4). The figures are lower for Latin America and Haiti. Whereas 20%–32% of females in all five Brazilian cities, Santiago,

TABLE 4. Percentage of 15- to 24-year-olds reporting use of contraception at first premarital sexual intercourse, by gender — selected Latin American countries, 1985–1989

Country (City)	Females	Males
Haiti*	9.9	22.7
Jamaica*	40.9	11.0
Mexico City	22.3	30.7
Guatemala City	10.4	14.9
El Salvador	4.2	NA
Honduras*	4.3	NA
Costa Rica†	22.4	32.5
Panama	11.3	NA
Ecuador		
Quito	8.4	14.1
Guayaquil	12.6	14.0
Brazil		
Recife	21.7	22.6
Salvador	23.1	19.5
Rio de Janeiro	31.6	21.8
Sao Paulo	31.6	21.9
Curitiba	27.0	23.5
Paraguay	14.0	NA
Santiago, Chile	20.3	18.7

*First coitus, regardless of marital status.
† Preliminary data for 1991.
NA: Not available.

Chile, and Mexico City reported that they or their partner used contraception at first premarital intercourse, <15% reported doing so in other surveys, including only 4% in Honduras and El Salvador. The use of contraception increases with age at first intercourse. Nevertheless, with the exception of Jamaica, <45% who had their first premarital intercourse at age 18–24 used contraception. In those surveys with data for males, contraceptive use at first premarital sexual intercourse ranged from 11% in Jamaica to 33% in Costa Rica.

In Mexico City, Quito and Guayaquil, Ecuador, Paraguay, and Santiago, Chile, the method principally used by females was rhythm. In almost all the surveys with data for both males and females, a greater percentage of females using contraception reported rhythm as their method of choice (Tables 5 and 6). Some males may not have known that their partner was using the rhythm method as they may not have been familiar with their partner's menstrual cycle patterns.

A greater proportion of young women in Panama and in four of the five cities in Brazil used oral contraceptives, and proportionately fewer used rhythm or vaginal methods. Except for Jamaica (about 80% of use), condoms were used by at least 20% of respondents who used contraception in Mexico City, Costa Rica, Quito and Guayaquil, and Sao Paulo. In Sao Paulo and in Haiti, withdrawal was the method most frequently reported. As mentioned above, condoms are the overwhelming method of choice in Jamaica.

Even though rhythm is reported as one of the three most used methods at first premarital intercourse by females in eight of the 13 surveys with method-specific data,

TABLE 5. Contraceptive method reported by females at first premarital intercourse, selected Latin American countries, 1985–1989 (percentage distribution)*

Country (City)	Pill	Condom	Rhythm	Withdrawal	Vaginal† methods	Others§	Total	Cases
Haiti	7.0	16.3	9.3	37.3	4.7	25.6	100.0	34
Jamaica	10.5	78.7	1.8	8.6	0.2	0.7	100.0	575
Mexico City	9.2	21.5	43.7	9.2	12.6	4.6	100.0	87
Guatemala City								**
El Salvador								**
Costa Rica¶	21.7	49.1	9.4	17.0	0.9	1.9	100.0	106
Panama	56.0	17.8	9.7	6.5	7.2	2.9	100.0	87
Ecuador								
Quito & Guayaquil	13.0	21.7	28.3	21.7	6.5	8.8	100.0	46
Brazil								
Recife	37.0	18.5	16.6	25.9	0.0	1.9	100.0	54
Salvador	38.0	12.7	24.1	24.1	0.0	1.3	100.0	79
Rio de Janeiro	49.1	8.2	15.5	27.3	0.0	0.0	100.0	110
Sao Paulo	21.4	23.3	7.8	45.6	0.0	1.9	100.0	103
Curitiba	53.8	15.1	14.0	16.1	0.0	1.1	100.0	93
Paraguay	16.7	10.7	27.5	12.1	7.0	26.0	100.0	50
Santiago, Chile	21.3	18.0	31.2	11.5	11.5	6.5	100.0	61

*Subtotals in this and subsequent tables may add up to 99.9 or 100.1 as a result of rounding.
†Foaming tablets, diaphragms.
§Folk and herbal methods.
¶Preliminary data for 1991.
**<25 cases.

knowledge of the most fertile period during the menstrual cycle is <31% for females and <26% for males in all surveys reporting this information.

Most respondents who did not use contraception at first premarital intercourse reported that they did not expect to have intercourse at that time and thus were not prepared to use contraception. No knowledge of contraception is also an important reason, especially for those <15 years of age at time of first intercourse. Overall, 51% of Jamaican males and 57% of Haitian females gave this reason. Among females, from 1% to 16% stated that they desired a pregnancy. Desire for pregnancy increased with age at first intercourse. However, <2% of males in each of the surveys gave this reason for not using contraception. In Guatemala City and three Brazilian cities, a substantial proportion of males said that contraception was the partner's responsibility. In Guatemala City, the first partner was generally a prostitute when this reason was given.

As discussed previously, the rate of sexual experience before marriage for males is much higher than that for females, but differences were less clear-cut when current sexual activity was examined. Of respondents who have had sexual experience, 11%–60% of unmarried females and 26%–48% of unmarried males were currently sexually active (intercourse within the past month) (Table 7). Of those currently sexually active, rates of contraceptive use were relatively high. At least half of sexually active females in all surveys reported using contraception (Table 8). Contraceptive use was 65% in Jamaica, Mexico City, Quito and Guayaquil, all five cities in Brazil, and Santiago. With the exception of Guatemala City and Haiti, contraceptive use was also high among sexually active males, ranging from 56% in Costa Rica and Rio de Janeiro to 82% in Mexico City. Sexually active females, with the exception of those in Mexico City, report oral contraceptives as the method most used. For males, the most used method is generally the condom.

TABLE 6. Contraceptive method reported by males at first premarital intercourse — selected Latin American countries, 1985–1989 (percentage distribution)

Country (City)	Pill	Condom	Rhythm	Withdrawal	Vaginal* methods	Others†	Total	Cases
Haiti	4.8	39.8	19.3	28.9	0.0	7.2	100.0	68
Jamaica	8.6	80.7	1.6	8.1	0.0	0.0	100.0	185
Mexico City	15.4	22.2	27.1	10.2	11.3	13.9	100.0	266
Guatemala City	27.0	25.4	7.9	6.4	27.0	6.3	100.0	63
Costa Rica§	18.2	71.7	4.3	1.9	0.0	3.9	100.0	258
Ecuador								
Quito & Guayaquil	12.5	54.2	16.7	4.8	6.5	5.4	100.0	168
Brazil								
Recife	33.5	38.9	5.4	15.3	0.0	6.9	100.0	203
Salvador	32.4	46.8	1.4	16.5	0.0	2.9	100.0	139
Rio de Janeiro	45.5	22.1	7.1	22.7	0.0	2.6	100.0	154
Sao Paulo	30.9	18.4	2.9	44.1	0.0	3.7	100.0	136
Curitiba	30.9	40.1	9.3	17.9	0.0	1.8	100.0	162
Santiago, Chile	22.7	10.3	27.8	20.6	1.0	17.6	100.0	97

*Foaming tablets, diaphragms.
†Folk and herbal methods.
§Preliminary data for 1991.

The AIDS "knowledge module" was used in eight South American cities—the five Brazilian cities, Quito and Guayaquil, Ecuador, and Santiago, Chile. Brazil has one of the highest rates of HIV infection in the Americas; the HIV rate in both Ecuador and Chile is relatively low. Nevertheless, knowledge of AIDS, or more correctly, having heard of AIDS, is almost universal in the eight cities (Table 9). Also, at least two-thirds of females and three-fourths of males agreed that a person can be infected without having clinical symptoms.

In all eight cities, the three principal modes of transmission—sexual intercourse, blood transfusion, and sharing infected needles—are known by 90% of young adults. However, there is also a great deal of misinformation about risks associated with receiving and donating blood; from 31% to 63% report thinking that HIV infection can be transmitted by mosquito bites, sharing utensils, or using the bathroom of an infected person.

In the five Brazilian cities, >62% of sexually active unmarried young adults say that sexually active unmarried young people have a high risk of getting the AIDS virus (Table 10). However, <6% of sexually active unmarried females and <10% of sexually active unmarried males think they themselves are at high risk. Percentages are lower in Santiago, perhaps reflecting the lower prevalence of HIV infection in Chile. However, the gap between the high risk attributed to others and self-perceived risk remains.

TABLE 7. Proportion of unmarried, sexually experienced 15- to 24-year-olds reporting sexual intercourse in previous month, by gender and age group — selected Latin American countries, 1985–1989

	Females (%)				Males (%)			
Country (City)	15–19	20–24	Total	No. of cases	15–19	20–24	Total	No. of cases
Haiti	NA	NA	17.0	105	NA	NA	27.8	206
Jamaica	NA	NA	47.8	1,418	NA	NA	47.6	1,705
Mexico City	28.6	33.0	31.2	154	22.6	31.6	27.5	720
Guatemala City	*	18.4	17.0	59	31.9	43.0	36.7	365
El Salvador	*	*	26.3	27				
Costa Rica†	NA	NA	28.6	214	NA	NA	30.7	631
Panama	25.8	21.8	23.2	316				
Ecuador								
Quito	NA	NA	10.6	85	NA	NA	25.5	505
Guayaquil	NA	NA	34.3	70	NA	NA	43.1	547
Brazil	49.0	36.8	41.1	243				
Recife	58.3	54.9	56.1	139	29.7	55.5	41.5	812
Salvador	31.1	49.3	43.2	220	27.5	51.7	38.4	662
Rio de Janeiro	62.7	56.9	59.5	247	31.4	62.9	47.0	636
Sao Paulo	40.7	44.2	42.6	190	24.7	44.9	34.8	566
Curitiba	44.7	54.6	51.0	206	32.2	58.9	46.1	603
Paraguay	22.4	20.5	21.2	162				
Santiago, Chile	43.3	33.0	36.9	179	21.6	35.3	29.3	451

*<25 cases.
† Preliminary data for 1991.
NA: Not available.

TABLE 8. Percentage of unmarried 15- to 24-year-olds reporting sexual intercourse in past month using contraception, by gender and method most commonly used—selected Latin American countries, 1985–1989

	Females				Males			
Country (City)	% Using	Method most commonly used		No. of cases	% Using	Method most commonly used		No. of cases
Haiti	*			*	33.8	NA		56
Jamaica	69.3	Pill (48%)	Condom (33%)	678	68.5	Condom (60%)	Pill (19%)	812
Mexico City	75.0	Rhythm (42%)	Pill (19%)	48	81.8	Rhythm (29%)	Condom (29%)	198
Guatemala City	*			*	39.6	Condom (55%)	Pill (17%)	134
El Salvador	*			*				
Costa Rica†	59.0	Pill (42%)	Condom (19%)	126	56.2	Condom (64%)	Pill (17%)	355
Panama	60.5		NA	69	NA			
Ecuador								
Quito	63.6§		†	33	77.5	Rhythm (38%)	Condom (28%)	129
Guayaquil					56.8		§	236
Brazil	52.4	Pill (72%)		99				
Recife	73.1	Pill (48%)	Condom (15%)	78	59.9	Condom (40%)	Pill (32%)	337
Salvador	67.4	Pill (66%)	Condom (16%)	95	65.0	Condom (44%)	Pill (30%)	254
Rio de Janeiro	77.6	Pill (66%)	Withdrawal (14%)	147	56.2	Pill (46%)	Condom (32%)	299
Sao Paulo	75.3	Pill (46%)	Rhythm (18%)	81	82.2	Condom (35%)	Pill (33%)	197
Curitiba	80.0	Pill (57%)	Withdrawal (14%)	105	65.5	Pill (48%)	Condom (35%)	279
Paraguay	54.2		NA	46	NA			
Santiago, Chile	65.2	Pill (40%)	Rhythm (23%)	66	59.5	Rhythm (28%)	Pill (18%)	131

*<25 cases.
† Preliminary data for 1991.
§ Quito and Guayaquil.
NA: Not available.

TABLE 9. Knowledge of AIDS* among 15- to 24-year-olds, by gender and city — selected Latin American

	Females (%)							
	Brazil					Ecuador		Chile
Percentage who:	Recife	Salvador	Rio	Sao Paulo	Curitiba	Quito	Guayaquil	Santiago
Have heard of AIDS	100.0	99.0	99.9	100.0	99.8	95.8	95.7	99.7
Agree that a person can be infected without having clinical symptoms	82.7	68.0	82.8	79.8	81.6	—— 76.7 ——		76.2

	Males (%)							
	Brazil					Ecuador		Chile
Percentage who:	Recife	Salvador	Rio	Sao Paulo	Curitiba	Quito	Guayaquil	Santiago
Have heard of AIDS	99.7	100.0	99.9	99.7	99.7	99.2	98.8	100.0
Agree that a person can be infected without having clinical symptoms	80.7	75.2	85.0	84.4	88.3	—— 80.5——		83.0

*AIDS=acquired immunodeficiency syndrome.

TABLE 10. Perception of risk of AIDS* among sexually active unmarried young adults, by gender and city — selected Latin American countries, 1988–1989

	Females (%)					
	Brazil					Chile
Percentage who:	Recife	Salvador	Rio	Sao Paulo	Curitiba	Santiago
Think sexually active unmarried persons have a high risk of AIDS	68.0	86.2	69.4	71.6	62.1	47.0
Think they have a high risk of AIDS	2.3	3.8	2.0	3.7	5.5	1.5

	Males (%)					
	Brazil					Chile
Percentage who:	Recife	Salvador	Rio	Sao Paulo	Curitiba	Santiago
Think sexually active unmarried persons have a high risk of AIDS	73.6	85.4	75.7	85.3	78.7	29.5
Think they have a high risk of AIDS	5.2	9.7	1.0	3.0	5.4	2.3

*AIDS=acquired immunodeficiency syndrome.

DISCUSSION

There is currently great concern regarding high fertility, unintended pregnancies, and sexually transmitted diseases among the teenage and young adult populations in Latin America. In response to this concern, many family planning programs directed at young adults have recently been implemented in urban areas. The surveys reported here provided the first representative data on this age group and will facilitate better planning and evaluation of programs for teenagers and young adults. For example, the fact that <60%, and in some cases <25%, of sexually experienced, unmarried young adults are sexually active helps explain the low continuation rate for contraceptives found in programs aimed at adolescents and young adults (*22*). Most sexually active young adults report low frequency of sexual activity, generally with one partner. The low frequency and apparent sporadic nature of sexual activity among young people may contribute to inconsistent use of contraception, as previously reported in the Caribbean (*23,24*).

In many areas, the most commonly used method at first intercourse was rhythm. However, <31% of female respondents in these countries could identify the most fertile period during the menstrual cycle. Of young males, <26% could identify the period of the menstrual cycle in which a woman is most likely to conceive. The combination of sexual experience at an early age and such lack of knowledge concerning reproductive health and contraception points to the need for effective sex education programs at the primary level in school and better surveillance data on youth risk behaviors.

Because of the socioeconomic and cultural differences between the nations of Latin America and the United States, data on young people from the two areas are not strictly comparable. Nevertheless, some comparisons are of interest. In general, with the exception of Jamaica, sexual experience rates for females in Latin America are lower than those found in the United States, where 52% of women ages 15–19 years and 75% of never-married 20- to 24-year-olds report premarital sexual intercourse (*25, 26*). In addition, 51% of females in the United States report that they had used a contraceptive method at first premarital intercourse, compared with a high of 41% in Jamaica among females ages 15–24 and 32% in other areas surveyed in Latin America. However, in the United States, only 32% of Hispanic women reported using a contraceptive method at first premarital intercourse (*27*).

The size and behavior of the young adult population studied here have important social, economic, and demographic implications for the future. There are currently 82 million persons ages 15–24 living in Latin America and the Caribbean. By the year 2020, this youth population is expected to reach 128 million, including 41 million in Brazil, 26 million in Mexico, and 8 million in Colombia.

In countries or urban areas where the level of contraceptive use among married women 15–44 years of age has reached 55% to 70%, and thus where family planning and public health officials can turn their attention to subgroups with special needs, these officials can focus on obtaining better information on risk behaviors among young adults, both male and female.

Acknowledgments

The author thanks the following survey directors who made available the data used in this report:

Mexico City	Anameli Monroy de Velasco and Leopoldo Nuñez
Guatemala City	Eugenia Monterroso
El Salvador	Luis Sidney Castro and Mario Caceras
Costa Rica	Victor Gomez
Panama	Federico Guerra
Jamaica	Dorian Powell
Haiti	Michael Cayamittes and Antoine Augustin
Quito/Guayaquil, Ecuador	Betty Proaño and Magdalena Torres
Brazil	José Maria Arruda
Salvador, Brazil	Virgilio Bastos
Sao Paulo, Brazil	Cecilia Mayer and João Carlos Vacarelli
Recife/Rio/Curitiba, Brazil	Elizabeth Ferraz
Santiago, Chile	Maria Solange Valenzuela
Paraguay	Juan María Carron

References

1. Darabi K, Philliber GO, Rosenfield A. A perspective on adolescent fertility in developing countries. Stud Fam Plan 1979;10:300.
2. Edmunds M, Paxman JM. Early pregnancy and childbearing in Guatemala, Brazil, Nigeria, and Indonesia: addressing the consequences. Path paper No. 11. Boston: Pathfinder Fund, 1984.
3. Morris L. Fecundidad adolescente en las Americas: datos y definición del problema. Memoria de la Primer Reunión Internacional sobre Salud Sexual y Reproductiva de los Adolescentes y Jovenes. Monroy de Velasco A, Martinez Manautou J, eds. Mexico: D.F., 1986:8–27.
4. Singh S, Wulf D. Today's adolescents, tomorrow's parents: a portrait of the Americas. New York: The Alan Guttmacher Institute, 1990.
5. Nuñez L, Monroy de Velasco A, Morris L, Bailey P, Cardenas C, Whatley A. Encuesta sobre información sexual y reproductiva de jóvenes en dos delegaciones de la ciudad de Mexico, 1985—informe de resultados. Centro de Orientación para Adolescentes y Academia Mexicana de Investigación en Demográfica Médica. México: D.F., 1988.
6. Asociación Guatemalteca de Educación Sexual. Encuesta sobre información sexual y reproductiva de jóvenes, 1986—reporte final. Guatemala: 1988.
7. Powell D, Jackson J, James V, Warren C, Morris L, Whatley A. Young adult reproductive health survey, Jamaica, 1987. Kingston, Jamaica: National Family Planning Board, 1988.
8. Bastos AV, Morris L, Fernandes SR. Saude e educacao sexual do jovem: um estudo en Salvador, Brazil. Salvador, Brazil: Universidade Federal da Bahia, 1989.
9. Valenzuela MS, Herold J, Morris L. Encuesta sobre salud reproductiva en adultos jóvenes, Santiago—1988. Santiago, Chile: Dept. de Salud Publica, Universidad de Chile Facultad de Medicina (Occidente), 1989.
10. Centro de Estudios de Población y Paternidad Responsable. Informe definitivo de la encuesta de información y experiencia reproductiva de los jóvenes ecuatorianos en Quito y Guayaquil. Quito, Ecuador: 1989.
11. Centro Materno Infantil de Planejamento Familiar. Investigaçao sobre saúde reprodutiva do jovem na cidade de Sao Paulo, 1988—relátorio final. Sao Paulo, SP, Brazil: 1991.
12. Gomez V, Grunberg M, Morris L, Whittle L, Hernandez D. Encuesta nacionál de salud reproductiva de adultos jóvenes—avance de resultados. San Jose, Costa Rica: Caja Costarricense del Seguro Social, 1991.
13. Ferraz EA, Ferreira IQ, Soares M, Morris L. Pesquisa sobre saude reprodutiva e sexualidade do jovem, Rio de Janeiro, Curitiba e Recife. Relatorio final. Rio de Janeiro: BEMFAM, 1992.
14. Arruda JM, Rutenberg N, Morris L, Ferraz E. Pesquisa nacional de planejamento familiar e sáude materno-infantil, 1986. Relatorio final. Rio de Janeiro: BEMFAM, 1988.
15. Centro Paraguayo de Estudios de Población. Family planning survey in Paraguay, 1987: final English language report. Asunción, Paraguay: 1988.

16. Barahona F, Suazo M, Bailey P, Calderon MA. Epidemiology and family health survey in Honduras, 1987—final English language report. Research Triangle Park, NC: Family Health International, 1989.
17. Asociación Demográfica Salvadoreña y Centers for Disease Control. Encuesta nacional de salud familiar, 1988. San Salvador, El Salvador: 1989.
18. CDC, Haitian Child Health Institute. Haiti national contraceptive prevalence survey, 1989—final English language report. Atlanta, CDC: 1991.
19. Kolbe LJ. An epidemiologic surveillance system to monitor the prevalence of youth behaviors that most affect health. Health Educ 1990;21:44–8.
20. Allen PD. Event history analysis: regression for longitudinal event data. Beverly Hills, CA: Sage Publications, 1984.
21. Morris L. Young adults in Latin America and the Caribbean: sexual experience and contraceptive use. Fam Plann Perspect 1988;14:153–8.
22. Chavez N, Monroy de Velasco A, Morris L, Reynoso L, Aguilar J. Estudio prospectivo del uso de métodos anticonceptivos locales en adolescentes. Presentado en el Primero Congreso Sobre Psicología Social. Trinidad, Mexico: 1986.
23. Jagdeo TP. Teenage pregnancy in the Caribbean. New York: IPPF Western Region, 1984.
24. Jagdeo TP. Mistakes, misconceptions, myths—a family planning study of Trinidadian adolescents. New York: UNFPA, 1985.
25. National Center for Health Statistics. Premarital sexual experience among adolescent women: United States, 1970–1988. MMWR 1991;39:932.
26. Forrest JD, Singh S. The sexual and reproductive behavior of American women, 1982–1988. Fam Plann Perspect 1990;22:206–14.
27. Mosher WD, McNally JW. Contraceptive use at first premarital intercourse: United States, 1965–1988. Fam Plann Perspect 1991;23:108–16.

State and Territorial Epidemiologists and Laboratory Directors

State and Territorial Epidemiologists and Laboratory Directors are gratefully acknowledged for their contributions to this report. The epidemiologists listed below were in the positions shown as of June 18, 1992, and the laboratory directors listed below were in the positions shown as of July 21, 1992.

State/Territory	Epidemiologist	Laboratory Director
Alabama	Charles H. Woernle, MD, MPH	William J. Callan, PhD
Alaska	John P. Middaugh, MD	Katherine A. Kelley, DrPH
Arizona	Larry Sands, DO, MPH (Acting)	Barbara Erickson, PhD
Arkansas	Thomas C. McChesney, DVM	Robert L. Horn
California	George W. Rutherford, MD	Michael G. Volz, PhD
Colorado	Richard E. Hoffman, MD, MPH	Ronald L. Cada, DrPH
Connecticut	James L. Hadler, MD, MPH	Sanders Hawkins, PhD
Delaware	LeRoy A. Hathcock, Jr., Ph.D.	Mahadeo P. Verma, PhD
District of Columbia	Martin E. Levy, MD, MPH	James B. Thomas, ScD
Florida	Richard S. Hopkins, MD, MSPH	Eldert C. Hartwig, ScD
Georgia	Joseph A. Wilber, MD	Elizabeth A. Franko, PhD
Hawaii	Richard L. Vogt, MD	Vernon K. Miyamoto, PhD
Idaho	Fritz R. Dixon, MD	Richard H. Hudson, PhD
Illinois	Byron J. Francis, MD, MPH	David F. Carpenter, PhD
Indiana	Mary Lou Fleissner, DrPH	Gregory V. Hayes, DrPH
Iowa	Laverne A. Wintermeyer, MD	W. J. Hausler, Jr, PhD
Kansas	Andrew R. Pelletier, MD	Roger H. Carlson, PhD
Kentucky	Reginald Finger, MD, MPH	Thomas E. Maxson, DrPH
Louisiana	Louise McFarland, DrPH	Henry Bradford, Jr, PhD
Maine	Kathleen F. Gensheimer, MD	Philip W. Haines, DrPH
Maryland	Ebenezer Israel, MD, MPH	J. Mehsen Joseph, PhD
Massachusetts	Alfred DeMaria, Jr, MD	Ralph J. Timperi, MPH
Michigan	Kenneth R. Wilcox, Jr, MD, DrPH	Robert Martin, DrPH
Minnesota	Michael T. Osterholm, PhD, MPH	Pauline Bouchard, JD, MPH
Mississippi	F. E. Thompson, Jr, MD, MPH	R. H. Andrews, MPH
Missouri	H. Denny Donnell, Jr, MD, MPH	Eric C. Blank, DrPH
Montana	Todd Damrow, PhD, MPH	Douglas Abbott, PhD
Nebraska	Thomas J. Safranek, MD	John Blosser
Nevada	Debra Brus, DVM	Arthur F. DiSalvo, MD
New Hampshire	M. Geoffrey Smith, MD, MPH	Veronica C. Malmberg
New Jersey	Kenneth C. Spitalny, MD	Shahiedy I. Shahied, PhD
New Mexico	C. Mack Sewell, DrPH, MS	Loris W. Hughes, PhD
New York City	Kenneth R. Ong, MD	Stanley Reimer
New York State	Guthrie Birkhead, MD (Acting)	Lawrence Sturman, MD, PhD
North Carolina	J. Newton MacCormack, MD, MPH	Samuel N. Merritt, DrPH
North Dakota	Larry Shireley, MS, MPH	James L. Pearson, DrPH
Ohio	Thomas J. Halpin, MD, MPH	Thomas J. Halpin, MD, MPH (Acting)
Oklahoma	Paul Zenker, MD, MPH	Garry L. McKee, PhD
Oregon	David Fleming, MD (Acting)	Charles D. Brokopp, DrPH
Pennsylvania	Dale R. Tavris, MD, MPH	Bruce Kieger, DrPH (Acting)
Rhode Island	Bela Matyas, MD, MPH	Walter S. Combs, PhD
South Carolina	Jeffrey L. Jones, MD, MPH	Vacant
South Dakota	Kenneth A. Senger	Kathleen L. Meckstroth, DrPH
Tennessee	Robert H. Hutcheson, MD, MPH	Michael W. Kimberly, DrPH
Texas	Diane M. Simpson, MD, PhD	Charles E. Sweet, DrPH
Utah	Craig R. Nichols, MPA	A. Richard Melton, DrPH
Vermont	Len Paulozzi, MD, MPH (Acting)	Burton W. Wilcke, Jr, PhD
Virginia	Grayson B. Miller, Jr, MD	Vacant
Washington	John M. Kobayashi, MD, MPH	Jon M. Counts, DrPH
West Virginia	Loretta E. Haddy, MA, MS	Frank W. Lambert, Jr, DrPH
Wisconsin	Jeffrey P. Davis, MD	Ronald H. Laessig, PhD
Wyoming	Stanley 1. Music, MD, DTPH	Carl H. Blank, DrPH
American Samoa	Julia L. Lyons, MD, MPH	Vacant
Federated States of Micronesia	Steven Auerbach, MD, MPH	Vacant
Guam	Robert L. Haddock, DVM, MPH	Arthur J. Loerzel, MD
Marshall Islands	Tony de Brum	Vacant
Northern Mariana Islands	Jose Chong, MD	Vacant
Palau	Maso Kumangai, MD	Vacant
Puerto Rico	John V. Rullan, MD, MPH	Raul Armstrong, DVM
Virgin Islands	Alfred O. Heath, MD (Acting)	Norbert Mantor, PhD

The *Morbidity and Mortality Weekly Report (MMWR)* Series is prepared by the Centers for Disease Control and is available on a paid subscription basis from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402; telephone (202) 783-3238.

The data in the weekly *MMWR* are provisional, based on weekly reports to CDC by state health departments. The reporting week concludes at close of business on Friday; compiled data on a national basis are officially released to the public on the succeeding Friday. Inquiries about the *MMWR* Series, including material to be considered for publication, should be directed to: Editor, *MMWR* Series, Mailstop C-08, Centers for Disease Control, Atlanta, GA 30333; telephone (404) 332-4555.

☆U.S. Government Printing Office: 1992-631-123/67031 Region IV

DEPARTMENT OF
HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control
Atlanta, Georgia 30333

Official Business
Penalty for Private Use $300

FIRST-CLASS MAIL
POSTAGE & FEES PAID
PHS/CDC
Permit No. G-284

HHS Publication No. (CDC) 92-8017